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EPITHELIAL INCLUSION CYSTS OF THE CONJUNCTIVA.*

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(*With five photographs on Text-Plate IX.*)

WITHIN the past few years I have occasionally examined epithelial-lined cysts which have appeared on the conjunctiva after the expression operation for trachoma. Evidently they had developed from epithelial cells which had been excluded from communication with the surface, either by adhesive occlusion at the mouth of a conjunctival crypt, or by approximation and agglutination of conjunctival folds. Formerly, cysts of the conjunctiva were rare, but since the introduction of expression for trachoma they have been observed with comparative frequency. A particularly good example of such a cyst was sent for examination to the laboratory of the New York Post-Graduate Hospital by Dr. E. M. Alger who also supplied the following history:

The patient, a boy twelve years of age, underwent the operation of trachoma expression at some hospital in this city. Three months later he first came under Dr. Alger's care at the New York Dispensary. On the conjunctival transition fold of the lower lid was a tense, semi-translucent

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† From the Pathological Laboratory of the New York Post-Graduate Medical School and Hospital.

cyst, about the size of a split pea. The cyst was opened and a clear fluid evacuated. It soon re-formed and was then thoroughly excised.

Microscopic Examination showed the specimen to be a serous cyst. Its walls were made up of loose fibrous connective tissue, covered externally and lined internally with epithelium of conjunctival origin (Fig. 1). The epithelial cells which covered the outer or conjunctival surface were young, actively proliferating, and closely packed in superimposed layers. Goblet cells distended with mucin were very numerous (Fig. 2). The cells which lined the cyst were histologically identical with those on the conjunctival surface, but differed from them in that they were older, fewer in numbers, and less coherent. The superficial layers of cells were more or less degenerated and were being cast off into the cavity of the cyst. The cyst contents were composed of a slightly albuminous fluid, degenerated epithelium, and cellular detritus (Fig. 3).

The mechanism by which these cysts are formed undoubtedly varies, but the essential feature is *the segregation of some cells from the surface epithelium by inclusion in the substantia propria of the conjunctiva.* This is brought about by special conditions, an ideal one being the operation of trachoma expression. When the conjunctiva is inflamed, the concomitant swelling of the substantia propria and subconjunctival connective tissue serves to increase the depth of the conjunctival crypts and furrows and to bring the surfaces of conjunctival folds into apposition (Fig. 4). It is, however, improbable that these apposed folds will grow together so long as they retain their epithelial covering. For this reason, cases of even severe conjunctivitis are not usually followed by adhesions, unless superficial necrosis has occurred and the epithelium been cast off with the slough. The traumatic conjunctivitis which follows expression differs anatomically from the conjunctivitis of infection. The squeezing and stripping to which the conjunctiva is subjected during

Illustrating Dr. Oatman's Article on "Epithelial Inclusion Cysts of the Conjunctiva."

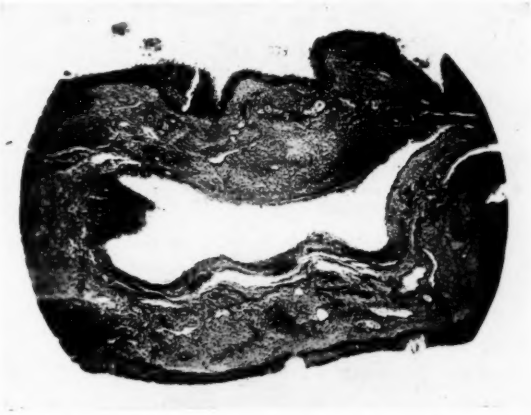

FIG. 1.—Epithelial inclusion cyst of cyst of conjunctiva.

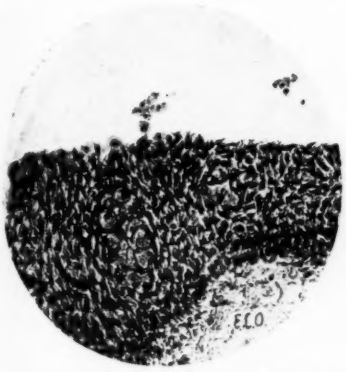

FIG. 2.—Epithelial covering of cyst.

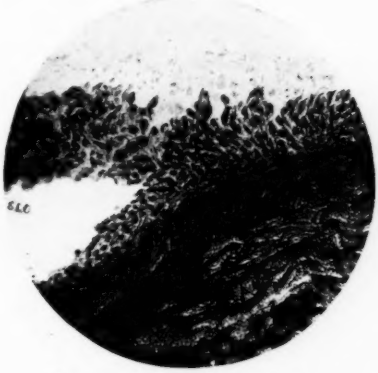

FIG. 3.—Epithelial lining of cyst.

FIG. 4.—Approximation of conjunctival folds due to swelling of substantia propria.

FIG. 5.—Conjunctiva after expression. Union between the abraded surfaces would segregate epithelium at bottom of crypt.

mechanical removal of trachoma granules necessarily tear off irregular patches of epithelium or, if the operation is roughly performed, the membrane itself may be shredded or removed. The swelling which follows the operation throws the surface into deeper folds and brings into contact conjunctival surfaces more or less abraded and denuded of epithelium. If two opposed raw surfaces of these swollen or lacerated folds unite, the epithelial cells still attached to the conjunctiva or lying at the bottom of a crypt and included within the folds will thus be shut off from communication with the surface. Subsequent proliferation and degeneration of such isolated cells will result in cyst formation (Fig. 5). The commendable practice of breaking down the adhesions which follow trachoma expression usually serves to prevent the formation of cysts. These growths are chiefly interesting as a demonstration of one method of cyst formation in the conjunctiva. The treatment is ablation. It will be observed that, in the case of the patient described above, opening the cyst did not effect a cure.

TWO CASES OF KERATITIS DISCIFORMIS.

By Dr. OTTO LANDMAN, Toledo, Ohio.

(With three figures on Text-Plate X.)

IN 1901, Prof. E. Fuchs described keratitis disciformis in the *Klinische Monatsblätter für Augenheilkunde.* On page 515, he says: "The disease attacks persons in middle life and appears frequently after slight epithelial defects from trauma and herpes corneæ. [Still in 1901 he had collected only twenty-eight cases.] It is characterized by a faint gray disc, which occupied the central area of the cornea and was separated from the transparent cornea by a more intense border. The surface of the cornea over this is dull and insensible. The lesion is in the middle layers of the cornea seldom less superficial. In the course of the disease which generally lasts several months, frequently small ulcerations appear, and there remains a pretty dense opacity." On page 517, he says: "Very often it happens, as Grunert had observed, not only one but two or even three concentric circles may bound the disciform area. The outermost circle seems not to be complete. The disease in the beginning runs a course without irritation, and the patient comes to the doctor on account of visual disturbance. Many cases run this course entirely, whilst others later develop hyperæmia and pain and at the same time the opacity increases in density."

The histories of the cases are as follows:

CASE I.

Feb. 5, 1906.—Chas. Price, aged twenty-six, farmer. He said that the eye felt for three weeks as if something had been in it and yet it did not annoy him much until the last few days. He said that when the eye first began to trouble him he had been sawing wood and that he thought that some sawdust had flown into it.

Stat. Præsens: Lachrymation and photophobia. In the centre of the cornea of the left eye is an opaque disc, limited externally by a very dense narrow ring, and, radiating outward from this, a very delicate halo.

The surface of the disc is somewhat dull and dappled, and the infiltration seems to be in the anterior lamellæ of the cornea. It does not stain with fluorescen. I prescribed atropin and dionin. Two days later a small infiltrate appeared downwards and outwards but very near the light halo; see Fig. 1. A week later two infiltrates appeared above the diseased area; see Fig. 1.

On Apr. 20th, under treatment all irritation had disappeared and the disc had grown slightly thinner.

On Oct. 20th I saw him again when the disc had assumed a kidney shape and the original dense ring was broken up and the opacity was thinner—Fig. 2. The vision was $\frac{6}{24}$. The small infiltrations were scarcely visible.

CASE II.

Oct. 13, 1906.—G. L. M., aged thirty-nine, farmer. Had a very slight simple conjunctivitis of the left eye, which gradually yielded to treatment.

On Nov. 10th, about a week after he had recovered from the conjunctivitis, he struck the left side of his head just at the outer edge of the orbit.

On Nov. 12th a disciform infiltration appeared in the central part of the cornea in its deeper layers. The area *did not stain* with fluorescen and was dull and stippled. A few days later he developed the most intense pain in the region supplied by the supraorbital and the nasal branches of the first division of the ophthalmic. There was ciliary injection and some

tenderness. The pain was greater at night and all of these same symptoms continued for a period of three and one-half weeks. Analgesics, salol, and quinin were tried without effect. Leeches gave no relief. Quinin was continued and finally the pain disappeared.

On Dec. 3d, the third week of the disease, I first noticed a change in the appearance of the cornea: a narrow encircling ring of infiltration made its appearance and the picture was like Fig. 3.

This ring then was *consecutive* to the first disciform infiltration. There was also at this time *insensibility* of the area covered by the infiltration. There were three zones, an inner or very dense area, a second outer less dense, a clear zone, and then the dense ring whose two ends blended and became confluent with the second zone—Fig. 3.

On Dec. 17th the case was discharged—an opacity remaining, however. The vision was $\frac{5}{15}$. Atropin and dionin were continued with the hope of clearing up the opacity.

In the two cases cited, the first was characterized by an absence of irritation, whilst the second was emphasized by great irritation, by ciliary injection and pain, intense photophobia and neuralgia of the supraorbital and nasal branches of the first division of the trigeminus.

When the causes in these two cases are considered, we get but an uncertain history of trauma in the first instance, and in the second, the trauma was not to the eye but on the outer edge of the orbit. There was positively no epithelial lesion in either case, because every effort was made to detect any ulceration by very frequent instillations of fluorescen and always with negative results. Both cases presented almost identically the same picture of a central dense zone, next a trifle less dense zone, then the saturated border. This was a dense, narrow, almost perfect ring, limiting the whole, which was in its turn surrounded on all sides by the apparently intact cornea. There was *no tendency* to *necrosis* of the central portions

Illustrating Dr. Landman's Article on "Keratitis Disciformis."

FIG. 1.

FIG. 2.

FIG. 3.

of the infiltration, as has been mentioned and described by others. In the second case there was insensibility of the opaque area. The symptoms of the cases agree almost in toto with the classical picture of this disease drawn by Prof. Fuchs.

Etiology: On page 107 of his original article, Prof. Fuchs says: "Scrapings show nothing positive; several times staphylococci, and in Grunert's case once Morax-Axenfeld-diplobacilli, were found. Generally some slight injury to the cornea; sometimes a herpes zoster or herpes febrialis had preceded the attack."

In the *Klinische Monatsblätter für Augenheilkunde*, October, 1906, Dr. J. Meller reports an histological examination of a case of keratitis disciformis, the only one on record. A consideration of the history of this case shows that neither eye had been normal before this attack of keratitis disciformis; that there was severe iritis; there were deposits on Descemet's membrane; increased tension almost continuously; there had been hemorrhages in the anterior chamber; paracentesis had been performed, and finally the eye was enucleated. The iris showed an intense inflammation; also the ciliary body; hemorrhages in the iris; detachment of the choroid implicating the ciliary body. It seems to me that this eye suffering with so many complications and diseased tissues outside of the cornea would modify any corneal lesion so much that such conclusions as Dr. Meller reached might be questioned as final and correct. It is probably true, however, as he asserts, "that keratitis disciformis is a disease of inflammatory infiltration."

LITERATURE.

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OCULAR DISTURBANCES DUE TO PRESSURE UPON OR STRETCHING OF THE CERVICO-DORSAL SYMPATHETIC.

By Dr. JOHN DUNN, Richmond, Va.

The Spinal Eye.—This term has for several years suggested to my mind a distinct and complete ocular picture, a full description of which has not, so far as I know, found its way into medical literature. At all events, it has not in the minds of oculists generally the diagnostic value it deserves. Three cases will be reported. In all three the visible ocular symptoms were the same. The subjective symptoms varied only in degree, and in the last two the diagnosis of spinal disease, which examination confirmed, was made as soon as the eyes were looked at.

Case I.

Miss L., aged forty-two, complained that she suffered a great deal from her eyes and from headache—that no glass would allow her to use her eyes as much as she wished. Examination of the eyes showed an abnormally shallow anterior chamber; showed a pupil more contracted than normal, not a "pin-point" pupil, but a pupil sufficiently contracted, in the presence of a shallow anterior chamber and normal tension, to attract notice; showed an apparently convex iris, suggesting to the examining eye that the anterior surface of the lens was bulging. Looked at closely, it could be made out that the inner border of the convexity of the iris did not correspond to the pupillary edge, but was just beyond the sphincter pupillæ. The centre of the lens was, however, nearer the posterior surface of the cornea

than normal. I could make out no abnormality of the commissural fissure, no unusual congestion of the conjunctival structures Without further examination of the eyes, I asked the patient whether she had ever had any pain in spinal column. She replied, "No." I asked permission to examine the spinal region, and found a slight but demonstrable curvature of the spine, most marked between the shoulder-blades. While pressing along the side of the spine in this region, the patient winced and said: "Doctor, for several years I have had an almost constant pain under my right shoulder-blade." She is now being treated for spinal curvature. In this case intra-ocular examination revealed nothing abnormal in the fundus, With proper correcting lenses the vision was normal.

Case II.

Miss S., aged twenty-seven, consulted me about two years ago complaining of the same ocular symptoms which so annoyed Miss L. The picture presented by the iris and anterior chamber was in every respect identical with that given in the former case. Again I asked permission to examine the spine, and found a high degree of lateral curvature, most marked in the interscapular region, together with the same pain "under the shoulder-blade." In this case, as the patient stood erect the lower end of the right scapula was one inch from the centre of the vertebra, while that of the left was more than three inches distant. The appearances of the shoulder and hip usual in such cases were well marked. Up to the time of Miss S.'s visit to me she was unaware of the spinal condition.

Case III.

Miss C., aged thirty, of whose ocular sufferings I had heard a good deal before I had an opportunity to examine her eyes, had consulted several able ophthalmologists and had given each a prolonged trial, faithfully endeavoring to carry out the instructions given her. She had received no benefit whatever. As soon as I saw Miss C.'s eyes I asked to examine her spinal column, for the ocular picture in no way differed

from that presented in the above mentioned cases. To my surprise and disappointment, the spine was apparently perfectly straight, nor could I make out any symptoms which would aid me in my belief that the cervico-dorsal spine was the origin of the ocular manifestations. Accordingly, I went over the field already examined by her former oculists. Compound oblique astigmatism was present—correction of the whole of the refractive error or of various parts of it in no way lessened the ever-present painful manifestations of severe ciliary spasm. The only relief Miss C. obtained was through the prolonged use of atropia, paralyzing completely the ciliary muscle. Indeed, Miss C. asked time and again to be allowed to keep her pupils constantly dilated. The instant the effect of the atropia wore off, the pain in the eyes and in the head returned. Drugs gave no relief. I removed a large spur from the septum, in hopes that as it pressed constantly into the turbinate the cause might be found there. This effort was of no avail. Two wisdom-teeth were extracted, for one root of each was found to have been forced backwards in its growth until it pressed against the adjacent molar; the eye symptoms continued as before the extractions. All use of the eyes was forbidden and an outdoor life prescribed. This, too, brought no relief. Forced rest in a sanatorium did no good. Finally, about eighteen months after Miss C. first came to me, I received a letter from her, saying the cause of her trouble had been discovered; that an X-ray picture of her spine had been taken, and that there was found "a thickening of some kind inside the canal"; that she did "not understand exactly what was its nature." This case is easily the most interesting of the three; and the diagnostic value of the ocular picture which I have called "the spinal eye" becomes more apparent. Absence of (by me) demonstrable spinal symptoms caused me to neglect the diagnosis suggested by the eye conditions, with a consequent failure to relieve the patient.

The objective ocular picture and the subjective symptoms are both the result of chronic disturbance of the cervico-dorsal sympathetics. This clinical entity is not uncommon. I have seen it a number of times. All of

these cases complain of inability to use their eyes with comfort in reading, writing, or sewing. In none of the three cases here reported were there any visible changes in the fundus. In all three cases, with glasses correcting the refractive error the vision was normal. In all three cases the external muscular errors were slight. In one case the refractive error was +1 D. in each eye. In two cases there was oblique compound hyperopic astigmatism. In none of these cases, nor in any similar case which I have seen, has wearing glasses correcting the refractive error given the comfort the patient hoped for. In two of the three cases glasses gave no relief at all; the third case is too recent to make use of in this connection. In one or two cases the patient has apparently gotten some relief from the use of glasses. These cases were, however, not under observation long enough to learn the reason of this. In the worst case of this kind I have seen, that of Miss C., the wearing of glasses gave absolutely no relief whatever—indeed, any correction of the refractive error seemed only to aggravate the pain and discomfort. In all cases the pupil responded to the action of mydriatics, and the eyes which were examined more than once gave always the same refractive condition. In the case of Miss C. the ciliary spasm was very marked. In most of the cases the eyes were abnormally sensitive to light; in two cases photophobia was much complained of. Mrs. F., aged sixty, was the oldest case of which I have records. In this case too there was marked curvature of the spine in the cervico-dorsal region. In all cases I have seen, save one, that of Mrs. F., the pupil was contracted. In the case of Mrs. F. the pupil was in size about normal. This was probably explained by the fact that there were in the fundus neuro-retinal changes of nephritic origin. In all cases the shallowness of the anterior chamber was marked; in some cases, however, more so than others. In all cases there was present the peculiar bowing of the

iris, giving the appearance of a bulging lens beneath. In all cases the iris responded normally to light. In every case the symptoms were bilateral and equal in degree on both sides. In all cases the eyes were a source of almost constant discomfort; in some, of such intraocular pain as to be explainable best on the supposition of ciliary spasm.

In all cases save one, that of Miss C., there was present cervico-dorsal spinal curvature. In the case of Miss C., although judging from her letter spinal disease has been demonstrated, I have been unable to find out its exact nature. At first glance, where the objective symptoms described above are most clearly marked, the resulting picture suggests the one at times presented by certain intraocular conditions which are accompanied by marked lowering of the tension. Indeed, in the first of these cases which I noticed, I felt sure—judging from the appearance presented by the iris, anterior chamber, and lens—that I had to deal with eyes the seat of deep structural changes and it was only after a careful ophthalmoscopic examination that I convinced myself that the picture was one resulting from disturbance of the sympathetic. I then examined the neck of my patient, thinking it possible some thyroid disease might be playing a part in the production of the ocular condition. Finding no trouble in the neck, I next examined the cervico-dorsal region of the spinal column. I found there lateral curvature.

While I think the spinal trouble produces the symptoms described, I have no sufficient explanation of the exact mechanism of their production. It would seem that we have to deal with either partial paralysis of, or chronic irritation from stretching or pressure upon, the oculo-spinal sympathetic. Probably the latter. The myosis following extirpation of the cervical sympathetic is said to become gradually less marked and may disappear. In the cases under discussion the myosis persists. I have noticed no observation to the effect that, following resec-

tion of the cervical sympathetic, there results a bowing of the iris and apparent bulging forward of the lens with a lessening of the depth of the anterior chamber—which three symptoms together with a contracted pupil make the picture in the cases here reported. We must bear in mind, however, that, in cases where sympathectomy has been done for glaucoma, the eyes were already so diseased as to make the production and recognition of this picture practically impossible. Whether this picture is produced in normal eyes after bilateral sympathectomy has been done for the relief of the symptoms of thyroidism, I do not know.

I have had no opportunity of determining in what proportion of cases of lateral curvature of the cervico-dorsal spine the above mentioned ocular symptoms are present. That they are present in some cases is important, for the recognition of the cause of their production serves to explain why treatment applied to the eyes fails to give relief.

POSTSCRIPT.—Since the above article was written, now seven months ago, Miss C. has been so far relieved by the wearing of a steel jacket, that the eyes no longer show the evidences of sympathetic disturbance. With the disappearance of the picture the ocular sufferings have in a large measure disappeared also.

A CASE OF MONOCULAR OPHTHALMOPLEGIA INTERNA AND EXTERNA, WITH PARALYSIS OF THE ABDUCENS AND TROCHLEARIS.

By Dr. OTTO LANDMAN, Toledo, Ohio.

THE case is of interest because of its complete recovery and because it shows the possibility of a lesion causing pressure in the superior orbital fissure and compressing adjacent structures without involving the optic nerve.

The history is as follows:

Patient, B. W. S., aged twenty-eight. The onset of the trouble was very sudden. On August the 16th, the patient had some headache over the left side of his head, which persisted on the 17th when he developed a temperature of 100° F. The headache grew worse, and on the 20th he saw double a little and the upper lid of the left eye began to droop. I saw the patient in consultation with his family physician, who said that since the beginning of the attack he had tried analgesics of various kinds to control the pain. I found on the 20th that the patient had slight ptosis of the left upper lid, and no other paresis demonstrable. There was a slight proptosis. He closed the left eye voluntarily to exclude the second image, as he said, and on account of great photophobia. The pain was in the forehead of the left side and around the eye, and was present day and night. There was tenderness to pressure over the supraorbital nerve. Pupils of both eyes were very much contracted. The right eye was normal. Because of its sudden onset and preponderance of the supraorbital neuralgia the case was at first regarded as one of ophthalmic

migraine and therefore quinin was administered, but without obtaining any relief from the pain.

Aug. 23d.—I was called to see him again and found an *ophthalmoplegia externa.* Lues was suspected and not denied for he had contracted the primary lesion five years before. Inunctions of mercury and potassium iodide in large doses were now prescribed.

Aug. 26th.—With the exception of a trifle more protrusion of the eye the condition was the same. Still the patient said that the pain was less during the daytime. Fundus normal.

Aug. 28th.—Mydriasis and *paralysis of accommodation.* Exophthalmus. Less pain. Fundus normal.

Aug. 31st.—Paralysis of the superior oblique and external rectus. The case to-day was one of *complete ophthalmoplegia interna and externa with paralysis of the abducens and trochlearis.* Exophthalmus. Fundus normal. No pain to-day.

Sept. 4th.—Has not had any pain since the last visit, *i. e.*, for five days. Exophthalmus more pronounced. Fundus normal.

Sept. 10th.—Exophthalmus less, other symptoms same.

Sept. 14th.—There was a slight movement in the external rectus. Fundus normal.

Sept. 25th.—O. D., V=$\frac{6}{6}$. Jr. 1 at 8 inches.

O. S., V=$\frac{6}{18}$. $-1D^s$ V=$\frac{6}{6}$. Jr. 4 at 12 inches. External rectus gaining in power and he can move the eye downward a little. Fundus normal.

Oct. 2d.—The ptosis is disappearing. Pupil is normal. There is a slight divergent strabismus. Fundus normal.

Oct. 9th.—O. S., V=$\frac{6}{6}$. Jr. 1 at 8 inches. No diplopia. The movement of the eye normal. There was a very slight proptosis. Fundus normal. From now on the case was uneventful. Treatment consisted, after August 23d, of inunctions twice daily of a drachm of unguentum hydrargyri, for three weeks. Potassium iodide was given in increasing doses which rapidly rose to 750 GRAINS A DAY and was continued till October 23d.

To review the case briefly we find that the protrusion of the eye came on quickly.

There was *pain day and night*, but it was severest at night. The exophthalmus was too great to be explained by the relaxed paralyzed muscles and there may have been a gummous tumor in the region of the superior orbital fissure; there was something more than a periostitis. Goldzieher[1] says concerning the exophthalmus: "The rule is, however, that the question is not one of an orbital abscess, but of a hyperplastic process which extends from the periorbita to the orbital fasciæ."

The *diplopia* lasted for a little more than seven weeks.

The *fundus was normal* during the whole course *of the malady.*

The *vision was normal* except at one examination, when there was a spasm of the ciliary muscle producing a myopic refraction.

There was an *intense neuralgia*, which is contrary to the rule, for anæsthesia of the region supplied by the first division of the trigeminus is given as one of the symptoms in lesions in and around the superior orbital fissure.[2] The gradual implication of the muscles is of interest:

First a *ptosis*; three days later, an *ophthalmoplegia externa;* five days after this, an *ophthalmoplegia interna*, followed after an interval of three more days by a *paralysis of the superior oblique* and *external rectus* and *marked exophthalmus*. The eye was as immovable as if it had been stone. It was remarkable how quickly the pain all subsided when the antisyphilitic treatment was begun. The cause was probably a *gummatous process* in or around the *superior orbital* fissure, producing pressure.

The pressure is explained by the anatomic and physical condition of this region. According to Merkel and Kallius, a very dense connective-tissue membrane, several millimetres in thickness, closes the superior orbital

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[1] Goldzieher, " Ueber Syphilis der Orbita," Par. No. 10. *Sammlung zwangloser Abhandlungen aus den Gebiete der Augenheilkunde*, 1902.

[2] Wilbrand and Saenger, *Neuroglia des Auges*, pp. 215 and 218, vol. ii.

fissure, perforated for the passage of vessels, the oculomotor, abducens, and trochlearis nerves, and the first division of the trigeminus.

"Should this membrane become inflamed, then a consecutive, localized periostitis can induce dire results by strangulation of the nerves." [1]

The following cases will be quoted to emphasize the question of *prognosis* when one eye is involved.

(*a*) Fejer's case. A woman fifty-three years of age; complete paralysis of third, fourth, and sixth nerves and involvement of the first division of fifth. *Anæsthesia* of cornea, exophthalmus; complete recovery upon administration of potassium iodide.[2]

(*b*) Thompson reports: A complete paralysis of all the eye muscles of one eye, with *anæsthesia* of the ball and skin over frontal muscle, with slight exophthalmus. Optic nerve hyperæmic. Cure by antisyphilitic treatment.

(*c*) Areus saw monocular total ophthalmoplegia with ptosis and frontal pain; almost total amblyopia of the eye. Cured by antisyphilitic treatment.

(*d*) De Luca reported a case, monocular total ophthalmoplegia, great pain in the parts supplied by the first division of the trigeminus. Cured by antisyphilitic treatment except that a slight ptosis remained.

(*e*) Cooper reports a similar case cured, but the abducens remained paralyzed.

(*f*) Rochon Duvigneaud reports three other cases, in two of which the foramen opticum was implicated.[3]

Thus from the brief review of these cases the *prognosis* is very favorable when syphilis has been the cause.

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[1] Wilbrand and Saenger, *Neurol. des Auges*, paragraph No. 119, p. 317, vol. i.

[2] In "Ergebnisse der allgemeinen Pathologie (1901) und pathologischen Anatomie des Auges." *Bericht über die Jahre 1879, 1898, 1899*, p. 282. Orbita.

[3] Cases *b*, *c*, *d*, *e*, *f*, Wilbrand and Saenger, vol. i., pp. 317 and 318.

In two of the cases the optic nerve was involved, and in De Luca's case slight ptosis remained, and in Cooper's case the abducens remained paralyzed.

The case reported in this paper made a complete and perfect recovery within a period of two months.

There have been a few cases of monocular complete ophthalmoplegia reported, where trauma and other conditions have complicated the cases,[1] but this paper does not deal with such cases.

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[1] Through Dr. W. G. Spiller's courtesy I add the following references:

LLOYD. "Complete Unilateral Ophthalmoplegia." *Annals of Ophthalmology*, Jan., 1898.

BOUCHARD. "Un cas d'ophtalmoplégie unilatérale, totale et complète, avec cécité du même côté." *Journal de Neurol.*, Nov. 5, 1906, p. 549.

HOWARD I. HANSELL and WM. G. SPILLER. "Two Cases of Unilateral Total Ophthalmoplegia; Crossed Hemiplegia being Associated with the Ocular Paralysis in One Case." *Annals of Ophthalmology*, 1899, vol. viii., p. 328.

RESEARCHES ON THE PHYSIOLOGY AND PATHOLOGY OF THE LENS.

By Dr. GUST. FREITAG of Würzburg.

Translated from Vol. LIV., German Edition, March, 1906, by Dr. John I. Middleton.

(*With three figures in the text.*)

I. THE INFLUENCE OF CHANGES IN THE LENS UPON THE REFRACTION OF THE EYE.

I WAS led to make the following communication through the kindness of Professor Hess, to whom I now wish to express my sincere thanks. I wish to discuss here briefly and comprehensively the subject-matter of the title, and to try to gain new points of view for further research.

It is a matter of experience that the human eye in general becomes more hyperopic with age; to which changes in the lens chiefly contribute.

The question then arises, How can we explain a higher refraction caused by the lens in old age? Indeed, this is found not infrequently, and is even by many regarded as the rule in intumescent cataract; Förster mentioning it for the first time in 1873.[1]

There has lately been a renewal of the observations of a peculiar anomaly of the lens described as "false lenticonus," "lens with double focus," "pseudo-cataract," often classed with beginning cataract formation; whose essential quality is a greater or less difference in the

refraction of the several parts of the lens, so that periaxial high myopia is found, in contrast to a more hyperopic zone near the æquator.[2]

Similar are the relations between anterior and posterior lenticonus. Regarding these changes in the refraction of the lens, it seems right to cast a stronger light upon the optical conditions referred to. Conditions causing, wholly or partly, the refraction of the lens arise through alterations in curvature and index of refraction. Since the lens is not homogeneous, but consists of concentric layers whose refraction increases towards the interior, and which can be clinically distinguished, as age advances, as cortex and nucleus, the curvature of the nuclear surface and the nuclear index of refraction must be considered separately. For the influence of the lens upon the total refraction of the eye must be considered also with reference to its position towards the percipient surface.

Fig. 1.

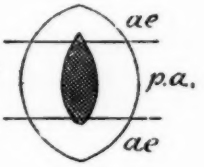

Fig. 2.

Donders[3] based the hyperopia of old age upon an increase in the index of refraction in the cortical parts of the lens. Whether this physiological decrease in the total refraction is generally of really so great an amount as is usually thought, is a question for further enquiry. If, according to Young,[4] Senff,[5] Zehender,[6] and others, the cortex be thought of as two concave lenses that surround the more or less spherical nucleus (Fig. 2), then must the effect that weakens the refraction of the nuclear part increase, the greater its index of refraction becomes.

Through the proof by Hess[7] of the regular presence of reflex images from the lens-nucleus in persons over twenty-five years of age, which usually are wanting under this age, we can definitely prove an increase in index of refraction between substance and cortex, as age advances. It does not then do for us, as Hess emphasizes, to explain senile hyperopia by increased index of refraction of the cortex, as this was pretty generally done; because, even accepting this, we must suppose an increased index of refraction on the part of the substance; which (other things being equal) would raise, rather than lower, the refraction of the whole eye. A diminution of the latter could be also conceived through decrease of the cortical index, while, according to the statement just made, an even greater diminution of the cortical index would have to follow. Such a physiological increase in the amount of water in an aged lens is contradicted by all experiments; so that, in the face of well-known facts and measurements, we need no further explain such a possibility.

Under these circumstances there remains, for the explanation of the lessened refraction of the senile lens, nothing but an increased destructive action of the cortex to be considered; and for this we must seek as causal indication not a growth of its coefficient of refraction but, among the more immediate possibilities, an increase in the lens-radii; and this without regard to an increase in nuclear curvature, whose influence is yet to be explained. This consideration is of value with the view most generally advanced, that the surface of the lens is more curved than its cortex. If, as seems justified by the occasional appearance of flat nuclei, we suppose a greater radius for the nuclear circumference than for that of the whole lens—at least in some cases—then the cortical parts lying fore and aft upon the nucleus act no

Fig. 3.

longer as condensing lenses; being able no longer to weaken the refraction of light through the nucleus, but only to strengthen it. (Fig. 3.)

In this case, then, we can expect a rise in the general refraction as a result of the increase in the cortical index of refraction; while a diminution is only possible through a decrease in the condensing power of the cortex; which can ensue through a decrease in its refracting index or the curvature of its anterior or posterior surface. The occurrence of a decrease in the cortical index in old age is, indeed, not to be entirely excluded; still, on this point there are many contradictory views. By supposing the nucleus to be flat, as well as somewhat curved, we see in the reports to date an explanation of the physiological hyperopia of old age as lying most probably in the lens-radii; only in a very flat nucleus could lie the explanation of a physiological lowering of the cortical index. Increase in the refraction of the periaxial parts is to be expected, without considering the relations between the curvature of nucleus and that of cortex, always through increase of the nuclear index.

With the rise in refraction caused by the cortex we must, on the contrary, again consider the form of the nucleus. If the latter be more curved than the surface of the lens, the cortical layers act as concave lenses, and their weakening influence upon the nuclear refraction can be hurt, through decrease of either lental radii or cortical index. Now a lessening of the lens-radii occurs in both forms of lenticonus, whose refractive conditions are readily explained by it; whereas in the "lens with double focus" the very lack of recognizable change in curvature of the surface has led to the separation of its clinical picture from that of true lenticoni. A decrease in the cortical index in this questionable anomaly has been differently construed by Demicheri,[8] however.

In the myopia observed in intumescent cataract a

causal participation of the cortex, from before, inwards, is probable. This is indicated by the apparently inconsiderable change in the nucleus in questionable cataract, but above all by the shallow anterior chamber, so often seen. For this we must suppose an increase in thickness in the lens, in the first place; and this would result in a decrease in the refraction (other things being equal), which can be compensated for by an advance ot the vertex of the lens.[9] An increase in curvature of the anterior surface of the lens in myopia from cataract seems, then, doubtful: the regular increase in volume of the cortex surrounding the nucleus would first lead to an increase in the lens-radius. We must therefore take for the explanation of questionable cataract from myopia a lessening of the index of the cortex. Outside of the periaxial zones, the conditions are simpler in the æquatorial zone of the lens; for its refraction must be lowered by decreased index of the cortex as well as by increased radii of the lental surface.

The fact that in the foregoing remarks the physiological conditions of growth of the lens were not considered and will be but briefly touched on is based on the difficulty of measuring their influence by our knowledge to date. That the thickness of the lens increases with age is a fact, proved by measurements, [10, 11, 12]. The amounts given vary, between 2.46 *mm* for the age of 9–12 months and 6.5 *mm* in old age. Hess[13] found for the age of seventy-nine amounts of 4–5 *mm*. The very increase in thickness must occasion a loss of refraction, were not, through simultaneous advance of the anterior lens-surface and, with it, the optical nodal point of the whole system (with a resultant increase in refraction), a partial or complete compensation set up; but how much in a single case, every research has so far failed to show.

If we said above that senile hyperopia is to be explained by the decrease in the lens-curvature, the statement is

not affected by considering the physiological conditions of growth; because a general increase in the lens must result in an increase in its radius of curvature; and Priestley Smith has referred to this. The æquatorial zone, too, has its refraction lowered by enlargement of its radii. Stadtfeld has given the spherical aberration of the lens, for parallel rays (outside of the eye), as about 3 dioptries at a distance of 4.1 *mm* from the axis.[14] How far this normally higher refraction of the æquatorial zone can be influenced by the increase in lens-radii with age, and how things really are in the living eye, is not yet well known. We can, however, almost suppose that the refraction decreases relatively to the æquator, since the curve of the surface even in old age seems less than in the pupillary zone; the reflex image from the anterior surface of the lens grows in size towards the pupil's edge, even in very old people as well. Of this I have often been convinced.

The occurrence of myopia in intumescent cataract cannot be attributed to the physiological changes in the lens; but to the decrease in the index of the cortex is the most probable significance to be attached; counting the influence exerted by an advance of a swelling lens. In a "lens with double focus" we most probably have to do with abnormally great differences between the indices of nucleus and cortex. Already we have seen that this periaxial myopia without change of form can only be explained by increase of index of the nucleus or decrease of index of the cortex, or both. Through these two factors the occurrence of periaxial myopia can be understood; the influence, however, upon the refraction of the æquatorial parts must be different with each.

The very fact of an abnormally high nuclear index can have no influence upon the refraction of the æquatorial zone, whereas a lowering of the cortical index must be followed by a lowered refraction of the former. This last

would seem specially adapted to call forth differences between nucleus and cortex. The refractive conditions of "lens with double focus" so far noted are so discordant that it seems necessary to subject each case to more exact analysis. But this only pays when the clinical and experimental findings are carefully applied. So this condition had best be presented specially. But let us lay stress on one point. All eyes that in advanced age are attacked by the questionable affection have this in common: they formerly had good sight for distance, and thus were nearly emmetropic. A lowered index of the cortex, then, would have had to cause hyperopia in the lens-zone, the amount of which would be considerable as concerned the great influence of the diminution of the index upon the periaxial zone. It is now shown that, in a case of double involvement, pictured by Halben,[15] and among thirty-eight eyes examined so far by others, very high æquatorial hyperopia was present (13 dioptries); while periaxial emmetropia was proved. If so excessive a hyperopia as Halben's in an otherwise normal eye is to be thought a rarity, both eyes, after extraction, had good distant vision with plus 9 and plus 10 respectively—a proof that no axial hyperopia of any extent could be present. The high æquatorial hyperopia previously found must, then, arise mostly from the condition of the lens; whereby, anomaly of form not being accepted, a decrease in cortical index becomes possible. The author of the case describes a cataract formation of fine spokes spread over the whole lens. I leave it undecided how far by this means the decrease in the index seems more easy of explanation than if it occurred in an entirely clear lens.

The other thirty-eight eyes in the literature showed periaxial myopia in each case. There were, of these, thirteen (36%) æquatorially hyperopic—that is, on an average, 2.5–4 dioptries. But only eleven gave signs that the refraction as compared with that of the other eye

had undergone pathological change, since in two cases the same hyperopia existed also in the second sound eye. How far these eleven, though, are valid for such an acceptation, can only be proved by success in better basing the entire picture of disease on new observations. Most of the cases (twenty-two, or 64%) of "lenses with double focus" we must for the time being regard as true myopia of the lens-nucleus; because in each, æquatorial emmetropia, or else slight myopia, was present. If the influence of the nuclear curvature on the refraction in the cortical layers has been repeatedly thought of, no account has yet been taken of the exact relations of cortical and nuclear refraction.

If there is a difference in index between both, an increase in curvature of its boundary will cause both a higher refraction of the nucleus and a greater divergent effect of the cortex. Since now smaller curvature changes are necessary to alter the refraction of a lens, the greater its index is, so will an increase in curvature in the cortical-nuclear zone (through which the convexity of the nuclear surface decreases just as much as the concavity of the inner cortical surface decreases) strengthen the condensing power of the nucleus much more than the diverging power of the cortex.

Till now we have not succeeded in estimating the radii of curvature of the lens-nucleus; but the way to do it has been, perhaps, shown by Hess, through the discovery of physiological reflex images from the nucleus. This will be referred to in another place, where I shall also refer to the point at which, in the lens-axis, whether nearer the anterior or posterior pole, the layers of greatest refraction lie; since clinical observations of dislocations of the lens-nucleus occur (*i. e.*, behind in posterior lenticonus).

Without doubt, after all, the refraction of the lens, and, indeed, the refraction of an eye, is a most complex conception. Study of its separate terms will offer us

the key to understanding many a, till now, equivocal phenomenon. A step towards further understanding might be taken by thorough application of the cases of "lens with double focus," which offered so seldom, yet which do not apparently occur so seldom; by systematic consideration of the relations of the reflex images; by studying the refraction of the æquatorial parts of the lens in their relation to the periaxial in a large number of persons of different ages, we gain a footing for observing in what amount such differences in refraction exist and how far they are to be considered as physiological; besides any relations of this lens-condition to cataract formation. While this is undertaken by many, others, like Szily[16] and Hess,[17] decline further effort, based on the fact that lenses with double focus seem to become cataractous either late or never. Finally, we try to base by experiment the influence of nucleus and cortex upon the refractile relations in the lens as well. These points of view are to be the basis of later researches.

REFERENCES:

1 Discussion of the paper of Critchett at Heidelberg Ber. d. ophthal. Ges. in *Klinische Monatsbl. f. Augenheil.*, 1873, pp. 458–67 and 488–92.

2 For practically parallel incident rays two lental zones can be distinguished which can be separately treated: periaxial, within which all rays of light reach the nucleus, and æquatorial, which, on the contrary, usually hidden, wholly or in part, by the iris, consists of cortical substance (Fig. 1.). Yet "æquatorial" may serve as an abbreviation for "lying towards the æquator," since the true æquatorial region of the lens, even when the pupil is dilated, cannot be taken into consideration as regards vision.

3 DONDERS. *The Anomalies of Refraction and Accommodation of the Eye*, p. 174, 1866, Vienna.

4 YOUNG. On the Mechanism of the Eye, in *Philosophical Transactions*, 1801, vol. xcii; and in *Miscellaneous Works of the late Thomas Young*, pp. 28 and 29, vol. i, Peacock, 1855, London (Donders, l. c., p. 34).

5 VOLKMANN'S article, "Sight" in Part I, vol. iii, Wagner's *Handwörterbuch f. Physiologie* (Donders, l. c.).

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p. 66, 1856, Erlangen; and *Handbook of Ophthalmology*, p. 436, vol. i, third edition, Stuttgart.

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13. HESS. "Pathology and Therapy of the Lens-system." *Graefe-Saemisch*, 1905, p. 16, Part 2, vol. vi, second edition.

14. STADTFELD. Cit. in Hess, Anomalies, etc., p. 67.

15. HALBEN. "False Cataract." *Graefe's Archiv*, 1903, p. 277, lvii.

16. SZILY. "The Lens with Double Focus." *Klin. Monatsbl. f. Augenh.*, 1903, p. 44, July.

17. HESS. As quoted.

II. THE NUCLEAR REFLEX-IMAGES IN THE HUMAN EYE.

In his work on "lens-images that arise through reflection upon the nucleus of the normal lens,"[1] Hess could prove the regular occurrence of such in normal eyes of persons beyond the age of twenty, while till then the existence of such even in very old people had been regarded as entirely pathological (Guttman, Demicheri, von Szily, and others). Hess, on the contrary, did not find these images so constantly in young persons, although he saw them in one case of nineteen years of age; but he had not taken up a systematic search in youthful eyes, to any extent.

These physiological variations in the period of the first appearance of the nuclear images made it desirable to fix upon a greater number of people of the age referred to within which range individual differences are present. In the following pages I give the results of my own observations of this in eighty-one persons between five

and seventy-seven years of age. The people of greater age in whom nuclear images were to be expected surely were specially brought in, to gain a standpoint for comparison of the intensity of light in the nuclear images at various ages. The source of light used was the same as was portrayed in the publication mentioned. The binocular magnifying-glass was used, to enlarge the images. The utmost was done to attain regularity of the conditions under which the reflex images were to be observed, so necessary for comparison of results. All cases of opacity of the lens or deposits upon the anterior capsule were excluded; further, all corneal opacities, as far as they were sharply defined and not so small as to cause trouble only through a certain easily avoidable stoppage of light. Greater amounts of refraction are especially mentioned. Since the intensity of the lens-images depends upon the quantity of light meeting the lens, the breadth of the pupil had to be considered in each case. However, with a narrow pupil a negative result does not mean that with a wider one the nuclear images are not to be seen.

To estimate the case, with a negative finding, a minimal width of 6 *mm* of pupil was taken as a measure. All patients with a narrow pupil were homatropized, or, where this could not be done, excluded. An absolute uniformity of conditions was not to be reached in reference to the individual differences in effect of homatropin. Moreover, the intensity of the light of the osmium lamp could not be kept absolutely constant. The same was true of the distance of the lamp from the eye examined, though the lamp was supplied with two bits of metal for leaning it upon the forehead and upper jaw of the person examined. So, in general, the distance of the glowing thread from the cornea could be taken as about 5 *cm.* Thus the observations refer to this minimal distance. In each case the lens was illuminated temporally, nasally, above, below, and from the front.

The behavior of the extremely good cortical images (Purkinje-Sanson reflex-images) was naturally the well-known one: far behind the intensely light corneal image an anterior lental image of little light intensity and not sharply defined, and in front of it the little sharply defined image of the posterior lens-surface. The relative positions of the nuclear images were to be known by Hess's work: posterior nuclear reflex behind the cortical reflex, anterior nuclear reflex before the anterior cortex, movements of the nuclear reflexes in the same direction but less abundant than the homonymous cortical reflexes. One hundred and forty-seven normal eyes, in eighty-one persons, were examined. From the table we see that up to the age of thirteen inclusive, in no case was there a suggestion of nuclear reflexes. Among five persons of fourteen years of age there was in two a delicate gray film, between cornea and anterior lens-reflex, distinguishable. The first to show real nuclear reflexes was a girl of fifteen, but in the whole decade from fourteen to twenty-four years, a changing condition of the images considered was seen. In twenty-six cases at this period they were completely lacking in sixteen, while in the rest they were more or less clearly to be seen. The anterior and posterior nuclear reflexes were not always equally clear; as a rule, the anterior was visible more plainly than the posterior one. In four persons of twenty-four years the nuclear reflex—generally the anterior—was sharply defined. In every one over twenty-four, a very distinct nuclear reflex could be got. And after thirty-one, in none of those examined was the posterior one wanting. In one case I got it in one eye only—fifty-seven years old. And in a few cases before the thirty-first year it could not be found with certainty. Accordingly, from the basis of my observations, the middle of the twentieth year can be given as the period at which practically, as a rule, nuclear reflexes appear. But at least a whole decade before

this must be regarded as the period of physiological variation.

The statement made by Hess, that in man the difference in refraction between cortex and nucleus increases with age, is hereby confirmed; just so by the fact again proved by my cases that the nuclear reflexes become ever of greater light intensity with age. At the ages of sixty and seventy the anterior nuclear reflexes are distinguished, above all in reference to their light intensity, little or not at all from the cortical reflexes. That the posterior lens-reflex is generally seen somewhat later than the anterior one, is entirely beyond doubt; at least, by my own findings. Whether the suppositions here occurring—that the steeper index-curve appearing on the cortical circumference in old age develops later in the posterior lens-layers than in the anterior ones, or whether the light absorption of the aging lens-nucleus plays here a considerable rôle—must yet remain undecided; nevertheless, on this subject we can reach a conclusion, perhaps, by careful refractive examination.

The question raised by Salzmann[2] in a description of Hess's work, whether the nuclear reflexes "change their position in old age" (he means, their position with reference to the cortical reflexes), cannot be decided certainly with our present method of research. Even if we, through harmonious methods, confirmed changes in the reciprocal distances of cortex—or nucleus—reflexes, it would be hardly possible to draw correct conclusions as to the increase in nucleus in relation to that of the cortex at different ages. The anterior surface of the lens possesses, at different distances from the middle of the pupil, a different curve, of whose changes with age we know nothing.

Hence, the position of the appropriate reflex depends on many circumstances, difficult to overlook, and also in single cases not calculated; as would have to be, to answer

that question. The same is true of the other lens-reflexes. And this leaves out of account the difficulty of measuring accurately the depth of the reflexes, in any way at all.

In a case of seventy I once observed that the posterior lens-reflex lay before the posterior cortical one, though the distance of the source of light was the usual one. According to the above, such a departure from the rule is less wonderful. In the behavior of both eyes of one and the same individual in a single case, the one already mentioned, little difference could be found. The posterior nuclear reflex, in one eye not visible, was, in the other eye, of the least light intensity, yet clearly visible. In all other persons the two eyes differed in no wise as to the lens-reflexes.

In closing, I beg to thank Professor Hess for kindly reference and manifold support of my work. To the assistants in the clinic my many thanks are due, for their friendly aid.

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2. *Zeitschrift f. Augenh.*, Dec., 1905, p. 591.

TABLE SHOWING THE NUCLEAR REFLEXES PRESENT AT VARIOUS AGES

Patient.			Nuclear Reflexes.						Remarks.
			Anterior.			Posterior.			
Age.	Pupil *mm.*	1 or 2 Eyes.	clear.	uncertain.	failed.	clear.	uncertain.	failed.	
5	6	2			+			+	
5	6	2			+			+	
5	7	2			+			+	
8	6	2			+			+	
8	7	1			+			+	
9	6	2			+			+	
9	6	2			+			+	
9	7	2			+			+	
9	7	2			+			+	
9	6	1			+			+	
10	6	2			+			+	
10	6	2			+			+	
10	6	2			+			+	
10	7	2			+			+	
11	6	2			+			+	
12	6	2			+			+	
12	6	2			+			+	
12	7	2			+			+	
12	8–9	2			+			+	
12	8	2			+			+	
13	6	2			+			+	
13	7	2			+			+	
13	6	2			+			+	High myopia.
14	7	2		+				+	
14	7	2		+			+		Hyperopia of 5 dioptries.
14	6	2			+			+	
14	7–6	2			+			+	
14	6	2			+			+	
15	7	1			+			+	
15	6	2			+			+	
15	6	1	+	+		+			
16	9	1			+			+	
16	6	2			+			+	
17	7	1			+			+	
17	7	2		+				+	
17	7	2			+			+	
18	8	2			+			+	
18	6	1			+			+	
18	6	2			+			+	
18	8.5	2			+			+	

Patient.			Nuclear Reflexes.						Remarks.
			Anterior.			Posterior.			
Age.	Pupil *mm.*	1 or 2 Eyes.	clear.	uncertain.	failed.	clear.	uncertain.	failed.	
18	6	2			+			+	
18	7	1	+					+	
19	6	2			+			+	
19	5	2	+				+		
20	7	2			+			+	
20	6	2		+			+		
21	9	1			+			+	
23	6	2		+			+		
23	6	2	+					+	
24	6	2		+				+	
24	4	2	+				+		
24	5	1	+			+			
24	5	2		+		+			
24	6	1	+				+		
26	8	2	+				+		
27	6	2	+				+		
27	5	2	+			+			
27	6	2	+					+	
30	7	1	+					+	
30	4	2	+			+			
31	8	2	+					+	
34	5	2	+			+			
37	4	2	+			+			
42	8	2	+			+			
43	5	2	+			+			
49	7·5	2	+			+			
51	6	2	+			+			
54	7–6	2	+			+			
56	6·5	2	+			+			
57	7	2	+			+			Posterior nuclear reflex visible only in one eye.
58	6·5	2	+			+			
61	5	2	+			+			
61	7	1	+			+			
62	6·5	1	+			+			
63	7	2	+			+			
64	7	2	+			+			
68	7	2	+			+			
70	6	2	+			+			Posterior nuclear reflex certainly a little *before* the posterior cortical reflex.
73	8	2	+			+			
73	7	1	+			+			
77	6	2	+			+			

PARALYSIS OF THE FOURTH CRANIAL NERVE DUE TO TRAUMA, AND THE MEANS USED TO OVERCOME THE RESULTING PARALYSIS OF THE SUPERIOR OBLIQUE MUSCLE.

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THE comparative rarity of this condition is the excuse for reporting this case, and the means used to overcome the condition are believed to be not generally used, as inquiry and search find few cases of this palsy reported at all and but few ophthalmologists are using the amblyoscope in the exercising of paralyzed muscles. A few points of special interest in this case are: (*a*) The very distressing vertigo caused by the diplopia, and this is probably more annoying with this nerve paralyzed than any other of the ocular supply; (*b*) the non-effect of medicinal treatment at the time the exercises were started; and (*c*) the peculiar way the muscle gained strength, *i. e.*, the index for fusion on the Worth amblyoscope might be 25° for one week, and although the patient exercised daily for two or three ten-minute periods he would not be able to advance one degree, then perhaps the next day he could fuse as easily at 20° as he had the day before at 26°. The curve of improvement is very irregular and abrupt, and the time to overcome the last five degrees was almost the time needed for the reduction from 30° to 5°.

In an experience that covers many paralyses both traumatic and from disease, I have found that the greatest relative improvement is often and usually made in the

first few weeks—that is, the degrees of improvement; while in fact the deviation in this case increased 2° after iodides had been taken for two weeks and only began to decrease after the steady use of exercises for two weeks.

The Black modification of the Worth amblyoscope was used as it permits of a vertical adjustment most necessary in these images which are not on the same level. This instrument is ideal in that it allows each object to be seen no matter what the deviation, and is far superior to prisms when the deviation is great, and is much superior also for the practical accomplishment of muscle exercises for the relief of paralysis. All authorities agree that monocular paralysis of the superior oblique muscle without any other nerve or muscle being involved is exceedingly rare. The fourth cranial is more rarely affected by basal lesions than the third or the sixth, and still more uncommon are the cases in which it is the only nerve implicated, since the third nerve is almost always in the symptom complex and the sixth nerve and optic-nerve tracts and crossed hemiplegia usually form a part. Leber[1] reports two cases of falls on the head in which paralysis of the fourth nerve was the main symptom. As in my case there was no fracture, but Leber held the paralysis to be due to rupture of the trunk of the nerve owing to the concussion of the skull. Dunn[2] reports a case of fourth-nerve paralysis from blow on the head which I shall speak of later. The three above with my own are the only cases I can find in which this nerve was the only one injured from trauma. Neiden[3] reports a case in which paralysis of one fourth nerve was the only focal symptom of a tumor of the pineal gland the size of a walnut. And M. Quintela[4] reports two cases

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[1] *Archiv für Ophthalmologie*, xxvii., 1, S. 297.
[2] *Ophthalmic Record*, October, 1903.
[3] *Neurologisches Centralblatt*, 1879, Nr. 8.
[4] *Revista Med. del Uruguay*, April to July, 1902.

where paralysis occurred after trepanning of the frontal sinus.

My own case is as follows:

J. M., aged twenty-six, hoisting engineer, on September 26, 1905, was struck over the left temporal region by a piece of falling brick at a building at which he was working. He then fell through a skeleton floor about sixteen feet, striking on top of his head, slightly on right side. He was taken to the hospital and the scalp wound sewed up, and he was unconscious for some hours and bled from both ears and nose. On October 9th, I was asked to see him for a paralysis of one of the eye muscles. The Saturday before he became very dizzy and he had been that way until to-day. He had double vision in looking forward and down. It increased on looking toward the right side. I found paralysis of the superior oblique muscle and it was necessary to use a 26° prism to fuse the images. He complained of roaring in the ear and a great deal of vertigo. He stated also that on the Sunday before there had been a discharge of watery fluid from the nose, but I was unable to determine whether it was enough to indicate a fracture of the cranial bone. The ear canal showed the presence of blood clots and there had been a rupture of the membrana tympani. The noise in the ear was complained of most bitterly. Hearing was normal both by air and by bone for forks and whistle. Vision O. D. $\frac{20}{20}$ (paralyzed muscle), O. S. $\frac{20}{12}$. Fundus normal in each eye. The amount of prism necessary to fuse gradually increased to 28° and on the Worth amblyoscope the index was at 35° when images were fused. He had been placed on potass. iodid, 45 grains per day, from the day after injury, without improvement. In fact the deviation increased 2° or to 30° in all. When I saw him, October 9th, the muscle had not recovered any of its strength and I suggested that he begin the daily use of the amblyoscope. This was done daily for two weeks, when he was suddenly able to fuse the images at 25°, a few days later he fused them at 22°, then for about two weeks there was no improvement, then he began to fuse at 20°. About three weeks elapsed without any improvement although used daily,

and he suddenly fused at 14°. After that he overcame the paralysis slowly, as the dates and records show:

December	14, 1905	15°
December	23, "	13°
December	30, "	7°
January	6, 1906	10° (Head has been aching a few days.)
January	18, "	10°
February	12, "	5°
March	5, "	2°
April	8, "	0°

His ear record is as follows: His ear was treated by gentle inflation and some existing catarrh of the tube was treated also, and for many days he would feel very well. Slight roaring in both ears continued and dizziness lessened. There seemed to be two causes for dizziness, one when the ears were bad and roaring and second from the vertigo caused by double vision. Inflation would control the noise and ringing for some hours. November 6th, a careful test was made of the hearing and the right ear at that time showed bone conduction best and slight loss of hearing for voice, while left ear showed air conduction best, but so far as ordinary conversation was concerned he did not notice any loss of hearing. The ears steadily improved with the exception of a small furuncle in the canal, until November 11th, when the roaring lessened. He then complained of deafness in the left ear. This was only determined by most careful fork and whistle test and varied in intensity from day to day with the barometric pressure.

When I saw him last, May 25th, he was about the same and he still had noises in rainy weather or in changeable weather; he also had an attack of frontal sinus inflammation which was opened and drained. So far as his eye was concerned he made a complete recovery in six months. His ear probably suffered very little from the injury as he already had a certain amount of chronic catarrh of the middle ear and no tests had ever been made previous to the accident of his sight or hearing.

Dr. Dunn's case previously spoken of has the following exactly similar points with my own: No improvement until end of fourth week. Then a gradual improvement; and the last few degrees went so quickly that "he suddenly realized that his double vision was gone." I have no doubt that this nerve always recovers from paralysis in practically the same manner, viz., by weeks of no improvement and then suddenly gaining a large amount, to be followed by apparently no gain for some time. In my case the prognosis was of importance from the legal side as to the permanent injury done this man and how an equitable settlement should be arrived at. It was in looking up the chances of recovery that I noted only three cases reported, and that *Systems of Legal-Medicine* and *Accidents and Injuries* made practically no allusion to the trouble except that it was practically unknown. Dana (*Diseases of the Nervous System*, sixth edition) says: "This is a rare affection and not always easily detected; causes same as those of palsy of the third nerve." Bailey (*Diseases of the Nervous System Resulting from Accident and Injury*, 1906) says: "Injury to the fourth nerve has been rarely recorded. It sometimes occurs with other cranial nerve palsies, etc." To repeat what other text-books say would be a repetition of the above, and the trouble I had in giving a correct prognosis both to the patient and the Liability Company has led me to offer this paper as a solution to this problem when it confronts some other ophthalmologist in the future. With the history of these cases I believe that we may confidently expect a complete recovery of function in from four to seven months.

METASTATIC CARCINOMA OF THE CHOROID OF EACH EYE. BILATERAL DETACHMENT OF THE RETINA. REATTACHMENT OF THE RIGHT.

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Translated from the German Edition, Vol. LII., June, 1905, by Dr. Matthias Lanckton Foster.

(*With appended Plates II. and III. and two figures on Plate A.*)

IN 1903, Krukenberg tabulated the reported cases of carcinoma of the choroid, 37 in all. To these are now to be added one case reported by Oatman, one by Coppez, and two by Brewitt. In ten of these 41 cases both eyes were affected. It would be superfluous to increase this comparatively large number by the addition of another case unless it was distinguished by some special condition, and therefore I propose to deal less with the anatomy of the metastatic carcinoma than with the question of the healing of a retinal detachment.

A woman forty-seven years of age entered my private hospital Nov. 13, 1899, on account of total blindness of both eyes. The right eye had been blind for eight days, the left for two. She stated that she had always been near-sighted. Her right breast had been amputated four years before on account of a tumor. She was very anæmic and cachectic. Examination revealed a total detachment of the retina in each eye, with normal tension. There was no anomaly in the anterior segment of the globes; the mobility was not interfered with and there was no protrusion.

Not the slightest change was detected after fourteen days in bed with pressure bandage and sweating. No improvement was obtained through repeated subconjunctival injections of salt solution, or punctures of the sclera. Deutschmann's incisions were then made three times in the right eye and twice in the left at intervals of eight days. During her stay in the hospital the patient was attacked several times in the morning by severe headache, dizziness, and vomiting. Contrary to all expectation, the vision of her right eye returned during the last days of her stay so that she could see movements of the hand. On Jan. 17, 1900, she was discharged at her own desire. In the early part of March she called again. The vision of her right eye had improved so much that she was able to go alone about the streets, could see the hands of a watch, and could read ordinary print, but she was troubled by a marked night blindness. Unfortunately an accurate determination of the functional capacity and a description of the fundus were not obtained at that time. I wished to paint the peculiar ophthalmoscopic picture for my atlas of rare ophthalmoscopic conditions and made an appointment with the patient for the next day. But she did not appear. Her general condition had become worse and compelled her to remain in bed. I next heard of her death in the general hospital, July 3, 1900. From her sister I learned that after her admission to the hospital on June 4th she again completely lost the vision of her right eye.

The autopsy revealed cancerous formations in the apex of the left lung, in the lower lobe of the right lung, in the pleuræ of both lungs, and in the spleen. There was an extensive gray neoplastic growth on the dura mater on each side and in the left half of the longitudinal sinus. Between the occipital lobes and involving a large portion of each was a large tumor sharply demarked from its surroundings.

I obtained both eyes, hardened them in Mueller's fluid, and prepared them in the usual way.

MACROSCOPIC APPEARANCES.

Right eye: Opened horizontally. The sagittal diameter was uncertain because of the sunken condition of the cornea:

the equatorial diameter was 21*mm*. The entire uveal tract except the iris was enormously enlarged. The choroid and ciliary body formed a fairly uniform thick shell, the diameter of which varied between 1 and 2*mm*. The inner surface of the choroid appeared wavy. The ciliary body was thickened like a club with its inner margin rounded and arched. No ciliary processes could be seen. The thickening of the ciliary body extended to the roots of the iris, which seemed to be pressed slightly into the anterior chamber. No anomalies could be seen in the iris. The cut surface of the tumor was uniformly bright yellowish-gray, with here and there a dark point where a vessel had been cut across. The papilla was greatly swollen but the entrance of the vessels could be seen. The retina was in apposition with the choroid except in a few places where it formed little folds. The vitreous chamber was filled by a uniform gray mass. On the nasal side was a tumor on the surface of and involving the sclera from the equator to the dural sheath, 5*mm* thick at its thickest part. On the temporal side of the section was an epibulbar tumor 1*mm* thick which extended from the equator to the optic nerve. The consistency and color of these tumors were the same as those of the choroidal tumor. No connection between the intra- and extraocular tumors could be detected on the nasal side, but on the temporal side there was a looseness of the scleral lamellæ about the posterior ciliary vessels and nerves which rendered a connection between them probable. There was nothing abnormal about the cornea or the lens.

Left eye: Equatorial diameter 21½*mm*; sagittal uncertain because of the sunken condition of the otherwise normal cornea. There was the same shell-like condition of the entire choroid as in the right eye, but in some places its thickness was greater—2½*mm*. It became gradually smaller as it approached the ciliary body, which protruded into the eye in the form of a triangular point. The root of the iris also formed an angle toward the corneo-scleral margin. The iris appeared to be normal. The retina was totally detached, connected with the entrance of the optic nerve by a slender pedicle and lying anteriorly against the posterior surface of the otherwise normal lens. The small space in the retinal

funnel, as well as the subretinal space, was filled by a uniform black clot, which had become separated in the hardening fluid from the subjacent choroid. No epibulbar extensions of the tumor could be found.

MICROSCOPIC APPEARANCES.

Right eye: The normal structure of the choroid was completely gone except in the choriocapillaris and in parts of the layer of transitional vessels. The pigmented stroma cells had disappeared, leaving no traces in many places, in others isolated patches of pigment and traces of the processes of pigment cells. The stroma consisted of bands of connective tissue of different degrees of development, with long, oval, or spindle-shaped nuclei, which formed spaces of varying form and size in the beautifully red bands. Often long spaces that ran parallel to each other alternated with round or oval alveoli which were frequently very large and intercommunicating. This system of spaces was filled by an enormous number of typical cells, mostly epithelial, with large nuclei and very little protoplasm packed closely together, with others richer in protoplasm, but often with such indistinct margins as to give the impression of giant cells. Most of the nuclei were oval and very large, some measuring 12 or 15*mm*. The smaller the nuclei were, the better they were stained; only scattered particles of chromatin could be seen in the margins of the very large ones. Relatively few cells of the size and appearance of the ordinary round cell were mingled with the large epithelial cells. As these cell conglomerates were cut in the section longitudinally or otherwise there appeared to be in the alveoli of the stroma long tubes or round or oval nests of cells. In the middle and outer layers there were foci of softening of various ages and forms. Usually several alveoli were filled by a homogeneous mass stained red by eosin, or by granular detritus, evidently due to mucous or gelatinous degeneration of the tumor cells, because among the typical tumor cells in an alveolus cells could be frequently met with which were undergoing mucous transformation. In other places the softened contents had been completely absorbed, the spaces in the stroma had collapsed, and the

bands of connective tissue had fallen together. On the slides these places attracted attention by their bright color. Some of them contained masses of small pigment granules of hematogenous origin, the results of hemorrhages.

In the posterior and middle parts of the choroidal tumor there were very few vessels, while the choriocapillaris was well preserved (Plates II. and III.). The layer of transitional vessels could be differentiated as such, at least in places. Typical tumor cells were present within some of the transitional vessels and capillaries, also in one of the posterior lamellæ of the sclera and along a little vein which had been laid open by the section. The lamina vitrea was well preserved and adhered closely to the surface of the tumor (Plate III., *e*). This alveolar construction with the alveoli filled with characteristic tumor cells continued into the ciliary body but terminated abruptly at the root of the iris. In the ciliary body there were mingled with the large epithelial cells more small ones with round or oval nuclei which looked like ordinary round cells. The ciliary processes, iris, and filtration angle were intact.

The optic nerve behind the lamina presented the characteristic signs of a slight interstitial inflammation. The nerve fibres and the glia tissue exhibited no change. The papilla was greatly swollen by œdema from venous obstruction. Between the nerve bundles were numerous spaces which were filled neither by round cells nor coagulated fibrin. In its outermost layers and between it and the commencement of the granular layer were isolated, sharply defined, long or round nests of typical cancer cells which could not be demonstrated to be connected with the choroid. The retina lay on the choroid, folded in only a few places. The internal limiting membrane was detached from the layer of nerve fibres and lay in shallow folds (Plate III.). The interspace was in great part filled by a crumbly mass in which were suspended occasional migratory cells, hyaline flakes, and a very few round cells containing pigment. A small amount of pigment could be found in the layer of nerve fibres and the external granular layer close to the optic nerve and in the layer of nerve fibres toward the ora serrata. The pigment

occupied by preference the adventitial sheath of the vessels and was extracellular, in the form of brownish lumps of various sizes, or enclosed in round cells (hæmatogenous pigment). Mueller's basal fibres were somewhat thickened in only a few places (Plate III.). The individual layers of the retina were surprisingly well preserved. The outer granular layer was somewhat rarefied in places and in some places their nuclei mingled with those of the inner granular layer. The external limiting membrane had been penetrated in a very few places by the nuclei of the outer granular layer. The rods and cones were entirely gone, on many slides not even a cadaveric trace could be found (Plates II. and III.). The pigmented retinal epithelia also were either completely gone or were degenerated.

Most extensive changes had taken place in the space between the vitreous lamella of the choroid and the outer limiting layer of the retina. Large areas were occupied by a homogeneous layer, coagulated by the hardening fluid and stained red by eosin, which had originated from the great subretinal effusion that had formerly existed. (Plate II., *b*, and Plate III., *c*). In places it was absent so that the external limiting membrane lay either upon the lamina vitrea, or on a layer of newly formed connective tissue on the surface of the latter, but in most places it was as thick as the intergranular layer of the retina. Where the retina was folded it was even thicker as it filled in great part the space of the fold. Next to the limiting membrane it lost its homogeneous appearance and presented an edging of very delicate irregular network, apparently artificial. This layer contained various elements. In its innermost part were round nuclei, evidently from the outer granular layer, mostly scattered but sometimes in small groups; in the middle and outer parts retinal epithelium and the products of its transformation predominated. The retinal epithelium did not form a coherent membrane on the vitreous lamella until it reached the ora serrata. On many slides not a normal epithelial cell could be found, and they were wanting over areas of greater or less extent, or the position of the former layer was indicated by single cells, or by rows of cells lying near or over each other, with round or

oval, black or intensively stained large nuclei, often with enclosed molecules of pigment. On the vitreous lamella were scattered over large areas long, large pigment spindles in single or multiple rows. The nuclei of these cells were often so covered by pigment as not to be visible; others were round or oval, dull or intensively stained. Extracellular molecules and lumps of pigment were also present. In places there were long cords of pigment cells and amorphous pigment (Plate II.). Similar elements to those on the vitreous lamella were present in the transudate with the addition of large round masses of pigment and pigment cells.

Another peculiarity here was the presence of delicate fibres and firm bands of connective tissue. The fibres were for the most part very long and tense, running meridionally and enclosing oval or spindle-shaped nuclei which were necrotic or intensively stained. The nuclei were often enormously long, slender, and difficult to distinguish. Frequently pigment granules were close about the nucleus. These fibres extended though the transudate either singly, or several close together separated by interspaces. Dense bands of fibres were also scattered irregularly in the space between the optic nerve and the ora serrata which took a red stain and often attained a length sufficient to extend over several microscopic fields. Their breadth was variable. Some had scarcely the diameter of a granular layer, while others were as broad, at least in places, as the thickness of the retina (Plate II., *c*). In such places the layer of transudate was for the most part absent, as if it had been consumed in the formation of the fibrous bands. The latter ran meridionally, or took a slightly wavy course, and often joined with connective-tissue fibres to form lamellæ which contained a very few elastic fibres. They had numerous oval or spindle-shaped nuclei which varied as to their staining capacity. A particularly large layer of this newly formed fibrous tissue united the retina to the vitreous lamella for a considerable distance from the optic nerve. Where there was a fold in the retina and where there was a deep indentation in the surface of the tumor, the connective-tissue bands were stretched through the midst of the space thus formed (Plate III., *b*). As a rule,

the connective tissue developed gradually and extended uniformly for long distances, but a large band would suddenly cease with its rounded end extending into the transudate. Large bands also formed nodes (Plate II.) which pushed the retina forward. In such nodes the fibres were degenerated, some swollen so as to give the impression of hyaline substance, some crumbled into round or oval flakes, or angular fragments. Such places also contained balls of amorphous pigment and large pigment cells.

In its periphery the retina presented the appearance of senile œdema and the cylindric cells of the pars ciliaris retinæ were largely detached by a homogeneous effusion stained red by eosin, in which round cells and physaliphores were embedded. The anterior segment of the sclera, the lens, and cornea appeared to be normal.

The stroma and nests of cells were the same in the epibulbar tumor as in the choroidal, but it contained no foci of softening. It was apparently caused by propagation of tumor cells from the choroid, at least such cells were present in large numbers along the nerve sheaths and the sheaths of the ciliary vessels.

Left eye: The choroid was infiltrated with tumor cells from the optic nerve to the root of the iris, and the tumor presented about the same characteristics as the one in the right eye. There were more pigmented stroma cells to be found, some intact, others atrophied, and there were fewer and smaller foci of softening. The layer of transitional vessels and the choriocapillaris were almost completely involved in the tumor. The lamina vitrea was intact. The layer of retinal epithelium began as a continuous membrane at the ora serrata. Over large areas there was no trace of the retinal epithelium, or the only traces were large round or oval, faintly stained nuclei, or pigment granules strewn over the vitreous lamella. In places there were single large pigmented cells with nuclei jutting into the subretinal space. In other places intensively pigmented round cells lay in heaps. There were few colloid bodies on the vitreous lamella.

The retina was totally detached from the optic nerve to the ora serrata. The rods and cones were absent over large areas; where they were present large spaces existed between

the rows. In the parts adjoining the layer of rods and cones was a perfectly homogeneous mass of coagulated transudate which contained large roundish pigment epithelium, in isolated cells or in little groups, and also fine pigment granules. There were occasional pigment cells in the layer of rods and cones, and a very few in the outer granular layer.

The penetration of the tumor through the sclera, though not demonstrable macroscopically, was evident microscopically at a place corresponding to the passage of a vorticose vein. The optic nerve was filled with typical nests of epithelial cells in connective tissue. In its centre, where the central vessels could not be demonstrated, the foci were not as close together as in the margin. The pial sheath and the intermediate space between the sheaths were involved in the new growth, the dural sheath alone could easily be distinguished as such. In a longitudinal section the tumor cells could be seen to penetrate along the sheath of a posterior ciliary vessel into the optic nerve, and on one side there was a small tumor in the angle between the dura and the sclera.

These characteristics leave no doubt that this was a case of carcinoma. As it could not have occurred primarily in the choroid it must have been metastatic. It originated from the carcinoma of the breast, although four years intervened between the extirpation of the latter and the appearance of the metastasis.

The literature in regard to metastatic carcinoma of the choroid is so abundant that a consideration of this tumor might be omitted as not atypical, but there was one point in which that of the right eye was exceptional. It may be assumed as self-evident that a tumor of the choroid may cause detachment of the retina, but it is very peculiar that a retina which has been detached by means of a tumor should become reattached as the result of the growth of that tumor. I think that the microscopical examination furnishes a valuable contribution to our knowledge in regard to the reattachment of a detached retina. Although my results agree on the whole

with Uhthoff's, in many respects they are supplementary, and I am obliged to assume a different standpoint to explain certain anatomical conditions, without impugning the correctness of Uhthoff's explanation of his own case. His case was one of chorio-retinitis albuminurica. He considered the subretinal effusion to be an exudate and the bands of connective tissue which later developed between the retina and choroid to be an inflammatory product. This theory was supported by the presence of circumscribed inflammatory foci in the choroid where adhesions with the retina had taken place. In my case there were no inflammatory foci in the choroid and the vitreous lamella remained intact.

It may be well to consider the method of detachment before presenting my theory.

The cancer cells were doubtless carried into the eye by the blood and produced cancerous emboli in the choroidal vessels. The cancer cells proliferated in the vessels until they broke through the walls and rapidly spread in the loose stroma of the choroid. As they usually enter the choroid through the posterior ciliary arteries metastatic carcinomata generally occur about the optic nerve. It has never been explained why metastasis does not occur in the region supplied by the central artery, or in the choroidal veins. Brewitt pointed out that no case had been observed in which the retina had been affected simultaneously. My case forms an exception, but the extension of the carcinoma was not through the central artery. The isolated nests of cancer cells in the retina close to the optic nerve were plainly due to the transportation of cancer cells in the adventitial sheaths of the ciliary vessels.

Metastatic carcinoma probably starts in Sattler's layer, the same as sarcoma, at least the outer layers of the suprachoroidea and the choriocapillaris are not involved at first. As the tumor develops it may involve the entire

thickness of the choroid and leave the choriocapillaris almost intact, as proved by my case. It is apparently the flat extension of the new growth which enables the vision to remain comparatively good until it is suddenly lost through the onset of a detachment of the retina. The detachment is produced not by the crowding of the tumor, but by the nutritive disturbances in the affected choroid, which are partly toxic, from the metabolic products of the tumor, and partly caused by circulatory disturbances. When such disturbances can be compensated for by collateral circulation, the effects of these changes will be limited. When a great part of the choroidal vessels are involved in the tumor, or closed by emboli as in metastatic carcinoma, the pressure in the remaining vessels must be increased and a transudate or œdema will take place into the tissue of the choroid, which under the constantly increasing pressure must filtrate through the vitreous lamella between the retinal epithelium and the layer of rods and cones. In spite of the union between these layers there must exist a lymphatic interspace, because Schwalbe found that injections of Berlin blue very often penetrated between the pigment layer and the layer of rods and cones of the retina. The albuminous transudate is dammed to a certain extent in this lymph space. The relatively slow process exerts its injurious influence slowly, but before detachment takes place microscopically demonstrable nutritive changes have been effected in the retinal epithelium and the rods and cones. Wagenmann and Krueckmann have demonstrated how energetically and characteristically the retinal epithelium and the rods and cones react to nutritive disturbances. Ligation of the ciliary arteries induces degeneration in the regions supplied, so that microscopical detachments are produced by the destroyed epithelium and rods and cones. Pathologically changed retinal epithelium will at any rate furnish less opposition to the current of fluid

toward the retina, and with the increase of the transudate to a certain point detachment occurs, at first in the form of blebs, but finally separating the entire retina from the subjacent tissue. This process is rendered possible only by the creation of space for the detachment by means of the removal or absorption of the fluid of the vitreous, and an increase of tension, even though very transient, and not very high, must be assumed in order to press the vitreous fluid through the zonula into the posterior chamber. This, the secretion theory, seems to me the most plausible explanation of a retinal detachment caused by a tumor of the choroid. Even the author of the retraction theory, Leber, grants its correctness in this form.

This brief statement of the genesis of detachment is necessary in order to understand the equally important question of the reattachment of the retina. It is self-evident that the subretinal effusion must subside in order to permit the replacement of a detached retina. This may occur spontaneously and the influence of treatment is not as hopeless as formerly. In this case I believe that the operative procedures, particularly Deutschmann's incisions, should be accredited with a great part of the cure. If a diagnosis of metastatic carcinoma of the choroid had been made at first I would not have operated, but aside from the history of an amputation of the breast four years before, there was no indication of the presence of a tumor, and if the result had proved that an operation should not have been undertaken I think the error would have been excusable.

A large part of the sub- and præretinal fluid was permanently drawn off by the repeated scleral punctures, possibly also little hemorrhages may have glued the choroid and retina together at the points of perforation, but yet a great part must have been absorbed. The behavior of the choriocapillaris seems to me to be of

decisive importance in the absorption of the subretinal fluid, especially in cases of spontaneous recovery, in the same way as absorption of fluids from serous cavities is performed by the limiting membranes. There can be no doubt that simple absorption of the subretinal fluid may suffice to bring about reattachment through simple adhesion; clinical experience furnishes examples of spontaneous recovery with intact function and ophthalmoscopically normal fundus. During the subsidence of a subretinal effusion detached portions may be seen to become reattached, leaving no ophthalmoscopically visible traces. But this method of reattachment presupposes that the detachment has not existed too long and that no irreparable changes have taken place in the epithelium and the elements of perception, and this is rarely the case. The degeneration in the rods and cones or epithelium, which in ordinary cases probably precedes the appearance of the detachment, usually advances so that simple reposition of the two membranes is possible only in the places where these elements have been preserved. Where this requisite is no longer present the union between choroid and retina must assume another form.

Schmeller considers the changes which take place in the retinal epithelium a process which precedes detachment, and according to Krueckmann's investigations they may be considered an almost necessary postulate. The degeneration of the epithelium becomes more rapid and extensive with the onset of the detachment, because the epithelium is then inundated to a greater extent by the albuminous transudate. Even in cases in which the retinal epithelium appears intact at the first glance, swollen and roundish cells may be seen to be desquamating either singly or in groups, and the defects thus caused to be undergoing repair from the margins by proliferation of the epithelium. But this epithelium does not retain its normal arrangement, and while the young cells are either

deficient or wanting in pigment so much pigment may be heaped up as to suggest a pathological proliferation of pigment. This briefly sketched process had evidently to a great extent preceded the stage presented in the microscopic preparations of my case. While in other cases of retinal detachment the newly formed retinal epithelia are round, cuboidal, or angular, in this case most of the cells had a marked tendency to assume the spindle form. Some were so pigmented that the nuclei could not be seen, while the nuclei of others were brightly stained, or sometimes necrotic, with few pigment granules or none at all. These spindle-shaped cells, the origin of which from the retinal epithelium could be traced in every possible form of transition, developed into long fibres which lay singly, or united into bands or lamellæ without loss of their fibrous structure or of their nuclei, except at those places where the fibres had become disintegrated. These fibrous bands contained quite large heaps of amorphous pigment and pigment cells. A peculiarity of these spindle cells and of the fibrillæ formed from them was that they bridged over the retinal folds and the depressions on the inner surface of the tumor so as to facilitate the apposition of the retina by diminution of its surface. These fibres doubtless play an important part in bringing about adhesion between the retina and choroid as soon as absorption has taken place. With the exception of Axenfeld's case, in which simple adhesion took place between the two membranes, these bands have been found in all cases of spontaneous reattachment of the retina which have been examined microscopically.

Uhthoff considers it to be a product of adhesive choroiditis, a connective-tissue new formation of mesodermal origin. My opinion is different. In my case there were no foci of inflammation or inflammatory products in the subretinal space, while the vitreous lamella was perfectly intact. There were no blood-vessels even in

the densest bands of fibres, a condition which Krueckmann also holds to differentiate between an epithelial and a mesodermal formation. The even extent of the process over the inner surface of the choroid seems to me evidence against the origin of these fibres from inflammatory exudates, which usually are circumscribed in locality. The only theory which remains is that the formation of the connective-tissue bands is a product of the cells there present, which are epithelial and of ectodermal origin. There is nothing remarkable in this theory when we consider the analogous genesis of capsular cataract, the appearance of which greatly resembles these bands of fibres.

The theory that connective tissue can be formed from retinal epithelium is supported by other observations. Schmeller says that where retinal detachment is present with atrophy of the choroid, as in posterior staphyloma, atrophic pigment cells deficient in pigment and spindle cells are found. Hess found that the inner wall of an orbital cyst consisted of a thick layer of cellular tissue resembling connective, which contained elongated cells that proceeded directly from the pigment epithelium. The delineation of the changes in Elschnig's case seems particularly instructive as it was one of metastatic carcinoma of the choroid.

Indirect support is given the theory by the fact that the retina which had become reattached was not pigmented, although from the ophthalmoscopic picture a considerable migration of pigment would have been expected. This observation accords with those of Mueglich and Uhthoff. Pigment was present in the retina in Mueglich's case, but it was expressly stated that it was not as abundant as was to have been expected. In Uhthoff's case as in mine the retina was not pigmented, aside from a very few pigment cells in a few preparations. The principal reason was doubtless the intact condition of the external limiting

membrane. As single nuclei penetrated the outer granular layer through this membrane, it might have been expected that single pigment cells would be met with in the outer layers of the retina, as such cells lay with amorphous pigment in the subretinal space. But these cells were evidently unsuited for migration, and like many others were transformed into spindle cells and connective-tissue fibres. The degeneration of the epithelial layer was the cause of the destruction of the rods and cones of which no traces could be found. Doubtless the rods and cones must in time be destroyed as the result of the detachment of the membrane from the choriocapillaris through which it obtains nutrition, because the nourishment obtained from central vessels of the retina is not sufficient to support them for any length of time. But as useful vision may be obtained after reattachment of the retina, the elements of perception and the retinal epithelium, which form a physiological unit, must be present in sufficient numbers and with intact function. The total destruction of the rods and cones in my case, in which there was for a time comparatively good vision, can have taken place only after the reattachment of the retina as a consequence of the constantly advancing degeneration and transformation of the pigment epithelium, which should transmit nourishment from the choriocapillaris to the elements of perception. Even if the recurrence of total blindness may have been associated with the extremely rare coincidence of a metastatic cancer in the occipital lobe, yet the principal cause was the total loss of neuro- and pigment-epithelium.

This case demonstrates the great danger which still threatens the vision after reattachment of a detached retina. To be sure the metastatic cancer was a steadily advancing injurious influence, while other processes may exhaust themselves at a certain stage.

The bands of connective tissue formed from the de-

generated epithelium are often so large that they are visible with the ophthalmoscope. I agree with Uhthoff that they form the anatomical basis of the so-called striæ which have been considered by many to be pathognostic of a replaced detachment. In the description of a case of striæ in my *Atlas of Rare Ophthalmoscopic Conditions* I differentiated between retinal and subretinal striæ. This differentiation was confirmed by the microscopical examination of this case. The subretinal striæ, which I formerly thought were products of adhesive choroiditis, lie beneath the retina and the fibrous bands which run parallel to them. As retinal striæ, abrupt folds in the retina which cannot be smoothed out alone should be indicated. It may be contended that the name striæ should not be given to such folds, but it has hitherto been thus used, because the anatomical difference between the ophthalmoscopically similar pictures was not sufficiently understood. My case demonstrates that folds may remain after the replacement of a detached retina. I do not refer to the superficial prominences described by Uhthoff, which existed here and there in my own case, but to very abrupt folds the immediate surroundings of which were firmly adherent to the subjacent tissue or cemented to it by a thin layer of transudate. Such completely isolated folds can never become reattached. They are not produced by the contraction of the subretinal connective tissue pressing together and refolding the retina, which had perhaps already become attached, but they must be due to the fact that a retina which has been stretched by a subretinal effusion offers too great a superficies for the subjacent surface. In my case the diminution of the subjacent surface by the growth of the tumor during the existence of the detachment must be taken into account. Such retinal folds, ½ to ¾*mm* high, particularly if they still enclose transudate and Mueller's fibres are somewhat hypertrophied, must appear as sharply

defined white or greenish-white striæ, under certain circumstances with pigmented margins. Sometimes it is difficult if not impossible to differentiate them from the subretinal striæ, but prominent striæ may be positively pronounced retinal when a favorably running retinal vessel describes a distinct curve.

EXPLANATION OF THE ILLUSTRATIONS ON PLATES II. AND III.

Plate II.

Seibert oc. 1, obj. III. Enlargement 107. Hæmatoxylin-eosin stain.

a. Slightly wavy retina with well preserved layers, the rods and cones alone completely absent.

b. Large subretinal transudate under a superficial retinal fold, homogeneous, forming toward the retina alone a delicate mesh.

c. A large connective-tissue band with numerous long spindle-shaped nuclei. It forms a tumefaction above, which encloses a large mass of pigment. Above and to the left are to be seen plates of degenerated fibres. Below the band of connective tissue is a line of pigment formed from degenerated epithelium. Normal retinal epithelial cells are completely absent.

d. The inner layer of the metastatic carcinoma of the choroid with the stroma containing alveoli and cancer nests. Choriocapillaris preserved, the adjoining layers slightly involved. The pigmented stroma cells of the choroid completely gone.

Plate III.

Seibert oc. 1, obj. V. Enlargement 305. Hæmatoxylin-eosin stain.

a. Retina attached above, superficially detached below. Internal limiting membrane replaced by a pigment cell. Mueller's fibres slightly hypertrophied, the rest of the retina well preserved, except that the rods and

cones are wanting. External limiting membrane intact.

b. Between the retinal and choroidal limiting membranes (*e*) lies a very small homogeneous layer which contains spindle-shaped pigment cells; below are spindle cells, some strongly pigmented, others scarcely at all, with long processes which extend through a space which exists between them and the detached retina on the one side and the vitreous lamella of the choroid on the other.

c. Subretinal transudate, homogeneous toward the choroid, formed into meshes toward the retina.

d. Retinal epithelium in various stages of degeneration in the space between the vitreous lamella (*e*) and the connective-tissue fibres (*b*).

f. The innermost layer of the choroid. Choriocapillaris perfectly preserved, pigmented stroma cells completely gone. In the upper part of the picture behind the choriocapillaris is a small group of epithelial cells, and in the middle of the picture above is an oblique section of a vessel. Above and to the right in the alveolar stroma are numerous cancer cells.

ABSTRACT OF ARTICLES IN VOL. XLIII., GERMAN EDITION (1901), NOT PREVIOUSLY TRANSLATED.

By Dr. PERCY FRIDENBERG, New York.

The Law of Electric Stimulation of the Optic Nerve.

By Dr. **EDUARD RICHTER,** Plauen.

SINCE Helmholtz, it is generally stated that the optic nerve reacts to opening or closure of a constant current by "flashes," which, Kiesselbach adds, are caused by muscular contractions. To test this, I have had a pair of electrodes made which allow the nerve to be placed in a very short circuit. One electrode is a thin olive-tipped wound wire, about 16*cm* long. This wire is passed into the nose and carried backward until it touches the pharyngeal wall. The tip is then turned upward, touching the roof of the pharynx. The other electrode is staff-shaped, ending in a concave plate which is detachable and interchangeable, so as to fit the surface of eyes of various size. It is placed on the lids after having been covered with moist absorbent cotton. The first experiments were made on my own person, and all in a perfectly dark room. The following uniform reaction was noted: With a current of 2 volts, cathode on the eye, anode in the pharynx: cath. closure, negative; cath. constant, neg.; cath. opening, an almost completely uniform, faint light-field, like electric light, occupying the entire surface of the retina. Reversal of the electrodes produced similar phenomena. Increasing the intensity of the current to 4 volts, with the first position of the electrodes: cath. closure, neg.; cath. constant, neg.; cath. opening, a similar effect of light as with

the weaker current—a weak and rapidly disappearing faint light. Reversal of the current, no change. No optic-nerve reaction. With 6 volts, cath. opening was followed by a homogeneous, bright white light. Reversing the electrodes, there was a star-shaped or disk-shaped bluish-green light-effect, a somewhat less brilliant intermediary field, and a peripheral circle of light. This lasted as long as the anode was constant, with little change of intensity, and on opening the anode, was followed by a deep black field. With 8 volts, the same effect, but in greater intensity, was produced. With this intensity of current a certain stimulation more sensory than optical was felt in the nerve. These results show that the direction of the current alone is the deciding factor. The law may be stated as follows: If a stimulus, proportionate to the physiologic receptivity affects the optic nerve, a sensation of light is produced, in accordance with the centripetal light-perceptive capacity of this structure, which lasts as long as the stimulus continues. A stimulus running counter to the functional direction of the nerve, *i. e.* centrifugally, produces a light-effect only when the current ceases and the conduction in the nerve is reversed—restored, that is, to the normal. Irritation of cutaneous nerves in the vicinity of the eye shows that they merely act as prolongations of the electrodes and do not alter the phenomena.

It is to be noted, in refutation of Kiesselbach, that no muscular contractions about the globe, not even of the levator palpebræ, could be observed. In case the electrode is placed on the bare eye, the current must be decidedly weakened.

Further Remarks on Fukala's Historical Articles on Refraction and Ophthalmology.

By Dr. **ED. PERGENS.**

In an article on "Optical Lenses in Antiquity," Fukala says that "refracting glasses, correcting lenses, were in use at the time of Theophrastus, 370 B.C." This statement is based on the passage: "For the eyes (the emerald is) good (agreeable), for which reason gems of this stone are worn to see with."

Fukala is of the opinion that the emerald was ground like our loupes, and had refractive properties. Pliny, however, states that it was the color of the emerald which made it agreeable by resting the eyes, much like smoked glasses. Fukala also quotes a passage from Diodorus Siculus: "(The Hyperboreans) claim that from this island the moon can be seen so that it appears but little distant from the earth, and so that individual mounds of earth can be seen on its surface." Fukala concludes that they must have used lenses, and considers the so-called "Druid-heads" to have been refracting glasses. But it is quite certain that we cannot see mounds on the moon by any such means. The "mounds of earth" were undoubtedly cloud-effects, or interpreted by the people as nowadays they think they see mountains, and so on. The statement that Albertus Magnus wrote in 1200 B.C., is evidently a typographical error. In his second article, Fukala concludes, in contradiction of his earlier publication, that Nero was far-sighted and used a convex lens. It does not appear how the concave ground emerald suddenly became convex. Fukala simply says: "Of course, Pliny knew nothing about optics." However this may be, we can hardly suppose he could not distinguish between a convex and a concave stone. In his historical notes on mydriatics, Fukala mentions belladonna and mandragora as identical. Now, mandrake is as old as the hills, and is mentioned in the Ebers papyrus. Pharmacologists do not confound the two drugs. Atropa belladonna, Linn., is probably Galen's "Strychnos maniakos, while the various species of mandrake are known as Mandragora officinarum (Linn.), M. vernalis (Bert.), and M. autumnalis (Spr.). On page 210 of this article, Fukala has made one person of two different authors, and speaks of "Alkindus, also called Joannes Mesua." The first, Abu Jusuf El-Kindi, was a Mohammedan. The second ,Abu Jahja Ben Masweih, was a Nestorian. His name (Messia-) shows that he was a Christian. The confusion was probably due to the fact that Alkindi's "De Medic. Comp." is often printed with the works of Mesua.

Two Severe Injuries with Unusual Termination.

By Dr. **L. LANDSBERG,** Darmstadt.

I.—Penetration of the Cornea by a Piece of Bark.

A young man of nineteen felt a severe stabbing pain in the right eye, just as a railway train passed by. There was some circumcorneal injection, and a penetrating wound *4mm* long, in the upper part of the cornea. The anterior chamber was full of blood and the eye soft. The edges of the wound were blackened as if by cinder. The conjunctival sac was disinfected, atropine instilled, and an ice-bag applied over a light bandage. Next morning there was slightly increased tension. The blood was partially absorbed. Behind the corneal wound small black particles like India ink could be seen. Next day the tension was higher, the pupil rather large, lens intact. Large coagula at the bottom of the anterior chamber. The latter was opened with a lance at its lowest point, and tough blood-clot, but no foreign body, evacuated. The father of the patient afterwards stated that the boy had shot at a tree six or seven feet away. As no portions of the revolver or of the cartridge were missing (? P. H. F.) it is to be assumed (?) that a piece of bark was shot off the tree and struck the eye. There is no account of a similar accident in the literature of injuries of the eye.

II.—Incised Wound of the Ciliary Body, Cured with Retention of Perfect Sight, after Removal of the Bruised Tissues and Conjunctival Suture.

A boy of seven was injured by a piece of glass. He was seen after three hours' trip by rail with a handkerchief bound over the eye. There was an irregular angular wound about *1cm* long at the corneal margin. The eye was soft. A portion of iris with bloody black masses and a bead of vitreous protruded. The anterior chamber was full of blood. The eye was unshapely. It was a question whether enucleation should not be performed at once. In chloroform narcosis the prolapsed tissues were loosened, drawn out, and cut off. The soft masses of the ciliary body which protruded greatly were

abscised with a Graefe knife and the wound thus smoothed. Two sutures were passed through the episcleral tissue while the wound edges were held in contact with forceps to avoid loss of vitreous. The conjunctiva was drawn in from all sides and five sutures passed. Atropine was instilled repeatedly and iodoform dusted into the conjunctival sac. Both eyes bandaged. Two days later the wound had closed by first intention. Slight irritation, and ciliary injection. Blood mostly absorbed. Sutures removed on the fourteenth day. A year after the injury vision is $\frac{6}{6}$. There is a small scar in the vitreous with a fine cobweb extending a short distance from it. There is no retraction of the scar. The star-shaped contraction of the conjunctiva is the only trace of the injury. This case again shows the correctness of Kuhnt's advice to be as conservative as possible in the injuries of the ciliary body. The fear of sympathetic ophthalmia is not well founded in fresh cases, in which careful suturing may prevent traumatic irido-cyclitis.

A Note on the Anatomy of the Myopic Eye. (Incipient Conus; Annular Conus.)

By Dr. **L. HEINE**, Breslau.

A previous communication on the examination of six myopic eyes is now extended by a study of four more globes. Two of these were the eyes of a middle-aged woman with myopia of 3 D. In life a small crescentic conus was seen with the ophthalmoscope. The third globe, that of a man of fifty-one, had a myopia of 15 to 20 D, had a ring-formed conus and macular choroiditis. The other eye was emmetropic. The fourth globe was taken from a woman with multiple sclerosis. Central scotoma; M. about 7 D. There was an indication of a conus downward in both eyes. The cause of the formation of conus is to be found in the peculiarity of the envelopes of the globe and their different reaction to the increase of size of the globe. Retraction of the lamina elastica and conus formation go hand in hand. This is proven by nine of my ten cases. The fact that in my nine cases of typical conus the

maximum of distortion lay in the level of the lamina elastica, not in that of the sclera, speaks against a direct traction or pressure by the external ocular muscles as postulated by Stilling. The latter may, it is true, have some influence on the axis of traction and so on the form of the conus, but this theory cannot explain the ring-shaped conus. The external rectus alone could be the agent, and, as is well known, a nasal conus is only found long after a temporal conus has been present. Muscular action tending to produce such changes would be mutually antagonistic and neutralizing.

Morbid Changes in the Optic Nerve in Arteriosclerosis and Lues.

By Dr. **REINHARD OTTO,** Berlin.

(*A*) Four cases of Basal Arteriosclerosis with Compression Symptoms and Circumscribed Atrophy of the Optic Nerve.

(*B*) A case of Basal Syphilitic Vascular Disease with Pressure Symptoms and Cyst Formation in the Optic Nerve.

The first four cases are a contribution to the study of the severe changes and circumscribed atrophy produced in the optic nerve by sclerosis of the carotid and ophthalmic arteries, the enlargement and hardening of these vessels acting mechanically. The last case shows in addition to these changes from similar causes a further morbid process consisting in the formation of cysts within the nerve at the point of greatest pressure. The sections showed an effect of compression by the carotid alone in the intracranial portion of the nerve, of carotid and ophthalmic combined behind the foramen, and of the ophthalmic artery alone, within the foramen. The most marked lesion is found to be a circumscribed atrophy of that portion of the nerve situated directly behind the foramen. There is a secondary ascending and descending atrophy. It is noticeable that the central portions of the cross-sections are most markedly affected and that small hemorrhages are frequent in the neighborhood of the point of greatest pressure. The former change is seen particularly well at either side of the atrophic zone and consists in a flattening of the central nerve fascicles.

The last case was one of marked luetic changes of the basal vessels, with partial dilatation and partial closure of the bore. The right optic nerve is somewhat flattened behind the foramen, with changes like those noted in the four previous cases, but the atrophy is less pronounced. There are changes in the small vessels of the nerve, and evidences of perineuritis. The left nerve shows complete atrophy at the point of maximum compression, and there is a small zone here where all the tissues have disappeared. In the neighborhood of this cyst small hemorrhagic extravasates are seen, with compression of nerve fascicles and changes in the perineurium. Obliterating processes are found in small vessels extending along the nerve for a short distance. Pressure and vascular changes, particularly obliteration, seem to have combined in the causation of the cyst. Areas of softening were also found in corresponding parts of the brain. The small hemorrhagic extravasates seem to have had little part in this formation, as they are not infrequently found in compression of the nerve.

The Treatment of Trachoma with Icthargan.

By Dr. **MARCAL FALTA**, Szeged.

The prevalence of this affection in Hungary, and the lack of a specific remedy make it advisable to try any new drug which seems to offer the probability of cure or even of improvement. Operative procedures are to be used with great care and on specially selected cases only in view of the marked tendency to cicatricial contraction which is a well known feature of trachoma.

Icthargan is an organic silver salt in which the silver content is nearer that of the nitrate than it is in any other organic combination of this metal, the percentage being 30, as against 11 for largin. The rationale of the use of these preparations is to produce an intense silver action on the tissues without an eschar or coagulation which would prevent the chemical penetrating to the depths of the affected tissues. In icthargan the silver is bound to ichthyol which, as is well known, has a marked tendency to constrict blood-vessels, besides

penetrating deeply into the tissues with a bactericidal action. The preparation is a loose brown powder with a faint odor like ichthyol. It is only slightly affected by light, easily soluble in water, and should be kept in dark glass bottles as it turns reddish brown under the influence of sunlight. The toxic dose is 0.1–0.15 per kilo of body weight as compared to 0.015 for nitrate of silver.

The use of this preparation in numerous cases of chronic trachoma, many of them with marked pannus, was followed by rapid improvement in a comparatively short time. The chronic form with marked photophobia was the only one which proved stubborn. The more marked the corneal involvement, the greater the benefit from icthargan, as it cures a well developed pannus in three or four days. The trachoma nodules are somewhat more resistant, and generally require expression to hurry the cure. Icthargan generally causes some burning pain, which children stand better than adults, and after the use of strong solutions a bluish-white eschar may be seen on the conjunctiva, which is due to the high silver percentage. The solutions used ranged from $\frac{1}{2}-3\%$ in strength. Fresh cases of trachoma are cured in from 6–8 weeks.

Fatty Degeneration of the Pigment Epithelium in a Glaucomatous Eye.

By Dr. **G. ISCHREYT** and Dr. **G. REINHARD**, Libau.

In the case of a man of eighty-five with absolute glaucoma in both eyes, and attacks of pain in the right eye, the following condition was noted. O. D.: Slight diffuse opacity of the cornea with slightly dulled surface. The entire posterior surface was covered with small yellow-brown and orange-colored granules. The aqueous was turbid and contained similar precipitates which had also collected in small lumps and formed a layer running across the upper margin of the pupil. On enucleation and histological examination these corpuscles were found to be endothelial cells in a state of fatty degeneration. The only similar case recorded is that of Leber (1898) in which there was no microscopical examina-

tion. The brownish-yellow and orange granules in the aqueous were interpreted as fatty degeneration with hematogenous pigmentation due to hemorrhages in an inflammatory exudate. The fatty globules rose to the surface of the anterior chamber while the heavier albuminous particles sank to the bottom. In our case there was no evidence of hemorrhage into the anterior chamber. The precipitate consisted of round cells. No reaction of hematogenous pigment could be obtained, and the orange color was undoubtedly due to refraction in the fatty globules. Their accumulation in the aqueous was a part of a peculiar process of degeneration in the pigment epithelium, consisting in a disappearance of the pigment, amounting in some places to complete bleaching, and an emigration of the pigment cells. The pigment granules seem to have been set free by the destruction of their cells. The fatty degeneration is a later stage of the process. As the fatty degeneration was only found in desquamated cells, it seems probable that the aqueous contained fat in solution, and that this was precipitated, as Lubarsch says. An accumulation of fatty cells in the subretinal space probably originated in the pigment epithelium of the choroid. As there was complete occlusion of the pupil it is rather difficult to state the origin of the pigment cells in the aqueous, unless indeed they got there before the iris changes took place. It is possible that they came from the iris itself. There is no doubt that they wandered forward from the depths, probably from the pigment layer of the iris and possibly also from the pars ciliaris retinæ.

Factors in the Recognition of Test-Types.

By Dr. **ED. PERGENS.**

In the determination of the acuteness of vision by means of test-letters, other factors than that of sense perception are included, notably those of intelligence, judgment, and physical processes, such as irradiation, contrast, and so on. Still this form of test is retained, mainly because it is for the purpose of recognizing letters that the patients desire glasses, as well as for its convenience and the ease with which the test

can be followed by the examiner. Numbers and points have the objectionable feature that each object must be pointed out in turn. To determine the various factors which are involved in the recognition of test-types, I have made a series of investigations with large test objects in which the question of a recognition of slight differences was not complicated by fortuitous qualities which would enable judgment or intelligence to play a rôle. Fig. 1 is a regular, dodecahedron, made from a disk which appears at 50 metres in an angle of 5′, by cutting away 12 segments. At 16 metres the angular outline was recognized, and at 12 metres the number of sides could be counted. If only one segment be cut away, the flat side is recognized at 31.5 metres, almost twice as far. This is due to comparison with the curved outline remaining. Fig. 3 is a disk of which a sector of 1′ converging toward the centre is cut out. In this figure the relative quantity of black and white is at all points equal. The open, or white side (corresponding to the cut-out sector) is noted at 77.5 metres. If a disk of white .3′ in diameter is pasted over the centre of the black disk, the open sector is recognized at 124 metres. This is due to an associative action of neighboring surfaces of white. This figure also presents an optical illusion, appearing oval in the direction of the open (white) part of the periphery, while in Fig. 3 the sector does not appear to reach quite to the centre. Fig. 4 resembles that of Landolt, except that this shows no convergence of the borders of the cut-out. Fig. 5 is of similar construction, except that a square is used and a smaller square cut out of the periphery connecting with another at the middle of the figure. The opening was seen at 127 metres. Tests with small squares placed at various distances from one another showed that the maximum of visibility, *i. e.* of separation, was found when the separating interval was equal to the combined area of the squares. With four equally distant squares forming a square, the maximum is found when the distance equals or is somewhat greater than the amount of black on one side of the constructive square. The apposition of black in a square seems to have an attractive action.

A Contribution to the Pathology of Arcus Senilis.

By Dr. **M. TAKAYASU**, Japan.

The investigations of His, Canton, and Virchow have been generally accepted as proving that the corneal changes leading to the clinical picture known as gerontoxon are due to a fatty degeneration of the corneal tissue. Fuchs was the first to oppose this view and to attribute the opacity to a deposit of concrements of a hyaline substance, similar to that which produces pinguecula. The concrements lie just beneath Bowman's membrane, and may project into it, thin it, or even raise it up. Others are seated more deeply in the corneal lamellæ. The concretions do not seem to have any relation to the corneal cells, as they lie free on the surface of the lamellæ. They react to chemicals like hyaline, but more intensely, and are not affected by ether or chloroform so that they are not of a fatty nature as is generally supposed. Leber was able to obtain a calcium reaction by means of oxalic acid in a case of arcus senilis, and considers the concrements a combination of hyaline with lime.

My own studies are based on the examination of 20 eyes of aged subjects with marked clinical arcus, using children's eyes and those of aged persons without any trace of senile change, as a control. The globes were hardened in formalin and imbedded in celloidin. Frozen sections were stained with Sudan III. This dye is easily soluble in alcohol. It colors fat yellowish-red; free fat, as in milk, taking up the color immediately, while that in tissues requires about 15 minutes. Celloidin is the only organic substance which takes this stain, so that it is an excellent means of immediately recognizing fat in tissues or solutions. A saturated alcoholic solution of Sudan will keep perfectly well for six months or more. It has the color of claret. Permanent specimens are counterstained with hæmatoxylin, fixed in Farrand's solution, and mounted in glycerine. Oil and Canada balsam can not be used as the dehydration with alcohol would dissolve the fat. Specimens prepared in this way showed that the cornea in the region corresponding to the arcus senilis was thickly sown with yellowish-red globules—that is,

fat of various size. The smallest globules can hardly be distinguished with the immersion lens. Others are 3–6μ wide, and twice as long. The smallest granules are generally round. The larger and longer ones lie parallel to the corneal lamellæ. The granules are invariably inside the lamellæ and never in the intralamellar spaces. Here and there they are arranged at the poles of the nucleus of a corneal cell. The superficial layers and those near Descemet's membrane are most thickly sown, the middle layers less so. On the surface, the opacity is bounded by the limit of Bowman's membrane. The latter may end at some distance from the limbus. Each successive layer of opaque lamellæ reaches farther toward the periphery, producing a step-like boundary like that observed by Virchow in parenchymatous keratitis, and may reach far out into the sclera. The narrow translucent ring at the limbus which is considered characteristic for arcus senilis corresponds to the unchanged tissue between the corneal margin and the beginning of Bowman's membrane, but this applies to the surface layers only, as the deeper ones are occupied by fat granules to a point beyond the limbus as we have seen. Toward the centre of the cornea, too, the opacity can be followed microscopically much farther than the clinical appearance would lead us to expect. The pupillary area is always free. Specimens treated with Flemming's solution and stained with osmic acid gave the same results, but Bowman's membrane remained unstained although there can be no doubt that fat globules were present. Hæmatoxylin, eosin, and Van Gieson's stain gave negative results. In alcohol the granules dissolve rapidly and disappear completely. There is, accordingly, no doubt that the basis of arcus senilis is a fatty degeneration of the corneal lamellæ.

Tables for the Detection of Simulated Monocular Blindness and Amblyopia.

By Dr. **VON HASELBERG**, Berlin.

These tables depend upon the fact that red objects on a white ground are neutralized by red glasses, and appear black

when seen through green glasses. Snellen has made use of this in his charts and later in the optotypes. These are very fragile, not transportable, and are not sufficiently varied. A simulant can also pass these tests by closing one eye.

After correcting any error of refraction in both eyes, the subject is placed in position with his back to the wall on which the test card is to be hung up. The card should never be exposed until the test is begun. A green glass is placed in front of the supposedly weaker eye, and a red glass before the other. The subject is then told to turn round and read the card. The card should not be exposed to direct sunlight, as red reflects too much. In case of actual defect of vision, only the black letters will be read up to a point corresponding to the visual acuteness of the better eye. If the "blind" eye has good vision, the subject will read all the letters, as the red parts seen through the green glass look black also. In case of slight defect of vision, the complete letters will be read up to a certain point, and from there on the black ones only. Rapid closing of the "blind" eye will not help the simulant, as he will only be able to acquaint himself with a single row of letters and will make mistakes when he attempts to read the next. The test is well adapted to demonstration of simulation before a jury. The vision is slightly reduced by the colored glasses. This can be controlled by the examiner. The test can also be combined with the stereoscope, various letters or parts of them in the two different colors being printed on the two cards for the two eyes.

On Relapsing Vesicle-Formation and Keratalgia after Superficial Injuries of the Cornea.

By Dr. **W. STOOD**, Barmen.

Fuchs and Praun are the only authors who mention the clinical picture indicated in the title, which is characteristic and not exceedingly rare. The occurrence and course of this affection, of which I have observed 60 cases, is so uniform and striking that it is not necessary to detail a number of case-histories. The type of the disease may be described as follows:

The etiologic factor is usually an injury by blunt violence of mild degree, causing a slight abrasion with some bruising of the cornea. This generally heals in a few days and the patient is considered cured. After several weeks or months there is a feeling of discomfort in the eye, especially on awakening. The eye feels heavy, is opened with difficulty, and there are marked lachrymation and photophobia. After an hour or so, these symptoms disappear. Examination at this stage shows a small clear vesicle beneath the epithelium at the site of the original injury, or a slight raising of the surface. This point is quite sensitive to pressure or even the slightest touch. At times there is complaint of this sensitiveness as well as of photophobia and tearing at a time when even the most careful examination fails to reveal any change in the corneal surface. Examination of the patient on awakening will show a slight opacity or vesicle even in these cases, which will have disappeared in the course of a few hours. In severe cases the eye is much swollen, injected, and painful. There is no increase of tension. The vesicle ruptures, the pain disappears, and the defect rapidly heals, although there may be infection with the formation of an ulcer, infiltration of the base, hypopyon, and chemosis of the conjunctiva. After healing, with or without cauterization, there is rarely a relapse in these severe forms. The most characteristic symptom of the relapsing form is the occurrence of pain and irritation immediately after awakening. The formation of vesicles and the relapses seem to be connected with traction on or bruising of the surface, as incised wounds and the injuries caused by small foreign bodies are rarely followed by these complications. The condition was first reported by Arlt, as erosion of the cornea. Hansen reported several cases as keratitis bullosa, and ascribed the relapses to repeated although slight injury. Horstmann considered the affection a neurosis similar to herpes ophthalmicus. Grandclément describes the condition as keratalgia traumatica recidiva, but has never observed the formation of vesicles. A terminal neuritis is the probable cause. Cauterization is recommended by Bronner, Nettleship, Nieden, and others. In cases of relapse I have been accustomed to remove the anterior wall of the

vesicle with a small forceps and to allow the defect to heal under an aseptic bandage. Yellow precipitate salve was applied, with massage, only after the epithelium appeared perfectly restored or in case there was no vesicle formation or only a very small bleb. The application of salve and the massage were repeated by the patient every morning on awakening. The results of this treatment have been very gratifying and relapses much less frequent as well as less severe. I have had no occasion to administer quinine or other medicaments internally. I do not think that the neurotic factor is of moment. The mechanical disturbance of the epithelium and its forcible detachment from the underlying layers are the most important points. During the night the conjunctiva of the lids comes into close contact with the loose epithelium and the latter is slightly detached. Transudation from the deeper layer then takes place and a vesicle forms. If the vesicle be a large one, traction so affects the nutrition of the epithelial covering that it breaks down and a defect is formed. If on the other hand the vesicle be a very small one, there is no traction while the eye is open, and the subepithelial exudation is absorbed.

On Some Cases of So-Called Coloboma of the Optic Nerve.

By Dr. **PAUL KNAPP**, Marburg.

My clinical material consists of the case of a girl of sixteen whose left orbit, cornea, and lid-fissure were noticeably smaller than the right. Her vision was $\frac{5}{7}$, and there was H of 3 D. Convergent squint had been present for some time. At the inner-lower margin of the pupil there was an indication of a coloboma of the iris. The media were clear. The fundus showed the following peculiar condition. In place of the disk there is a light red oval, measuring 3 P. D. across. This is surrounded by a pigment wall, which is broken at the upper nasal quadrant. There is also an irregular reddish-white boundary. The vessels are divided into two groups which arise from the upper and lower margin of this area, respectively. Ophthalmoscopic determination of re-

fraction showed that this area was an excavation surrounded by a wall, beginning above and becoming deeper downward where it formed a crater *2mm* deep. Outward and downward there is a large defect of the choroid, probably an incomplete coloboma, as a few choroidal and fine retinal vessels run over the atrophic area which is surrounded by pigment.

Bach, Goerlitz, Ginsberg, and others have shown that the condition usually designated as coloboma of the optic nerve sheaths, without any clear idea of the developmental defect involved, is really not connected with the nerve or its sheaths and is nothing more than a cystic dilatation of the sclera at the point of entrance of the nerve. There is no actual defect of the sclera but it is undeveloped in the region of the fœtal eye-cleft. This occasionally involves the neighboring portion of the papilla, scleral ring, etc., producing the appearance of a coloboma. Preservation of useful vision speaks against any marked anomaly of the nerve itself. Deutschmann ascribes this and similar changes to inflammatory processes during fœtal life.

My material also included the eyes of an albinotic rabbit in which ophthalmoscopic examination revealed a marked scleral dilatation about the nerve-head. Sections showed a circumscribed thinning and dilatation of the wall of the globe. The nerve itself was implicated and appeared excavated. In the region of this cyst there is also a coloboma of the choroid. At the upper margin of the nerve there is a new formation of fibro-cartilage. There was no evidence of fœtal inflammation or of defective closure of the fœtal eye-cleft. Pichler has recently formulated a theory that insufficient amniotic fluid may cause pressure on the eye of the fœtus and thus cause developmental arrest with consecutive anomalies in the various tissues of the globe. This would explain coloboma and cyst-formation as well as the congenital microphthalmus noted above.

A Contribution to the Operative Treatment of High Myopia.

By Dr. **A. SENN**, Wyl.

The following report is based on 42 needlings, single in 8

cases, double in 17. The double operation is indicated wherever the refraction of the two eyes is approximately equal. It gives better results as to binocular vision, and is made impossible only by marked differences in refraction or the presence of marked fundus changes in one or the other eye. Of my patients, 7 were males, 18 females. The average age was thirty. The youngest patient was eleven, the oldest, sixty-three. Of my 25 cases, 13 patients and 23 eyes were less than thirty years of age; 12 patients and 19 eyes were between thirty and sixty-three years old. I have purposely made this division of the cases, as the age of thirty has been considered by many ophthalmologists the upper limit of safety in the removal of the lens in high myopia. As to astigmatism before and after operation, about one-half of the eyes had an astigmatism with the rule after operation about equal to that noted before. The other half had astigmatism against the rule of about 1.5 D., an increase of about 0.75 D. Reckoning axes not more than 10° from the vertical or horizontal meridians as straight, inclined axes were found, before operation, 6 times, and after operation, 9 times. Maximum astigmatism, before operation, 3.0 D. in 24 eyes; after operation, 2.5 D. in 14 eyes. The degree of astigmatism might be still further reduced if we knew the exact action of the lance-knife sections. In a general way, sections in the horizontal meridian produce astigmatism against the rule and tend to diminish an existing predominance of curvature of the vertical meridian. Sixty per cent. of my operated cases had cylindrical lenses, averaging about 1 D. The average of the myopia was 18.3 D; the mean corrected vision, about $\frac{1}{4}$, the patients under thirty showing comparatively sharper sight. The average of vision with correction, after operation, was $\frac{7}{10}$ for those under thirty, and $\frac{3}{10}$ for those above, the mean being $\frac{56}{100}$. Contrary to general opinion, elderly myopes have at least as much to gain from the operation as younger ones, but stress should be laid on the necessity of combined treatment, *i. e.*, operation with correction of refraction (including astigmatism of more than 1 D.), and the prevention or combating of fundus changes, such as central choroiditis by subconjunctival injections of mercury. This should also be used before

operation if possible. It seems that the removal of the lens has a favorable influence on the nutrition of the eye aside from any optical improvement. The injections of oxycyanate of mercury were effectually used where 2–4% salt solutions showed no action, and atropine, rest-cure, sweat baths, and mercurial inunctions had produced little or no improvement in vision. It is to be noted that apparently inveterate choroidal affections were favorably affected and the vision of an almost useless eye brought up to or beyond that of the other. This may require prolonged treatment which should be persisted in even if there is no visible improvement at the end of the first week. Macular disease of mild degree may disappear completely, although at times the improvement in the ophthalmoscopic picture does not correspond to the increase in vision. Combined treatment certainly seems to widen the scope of the operative procedure besides increasing the probability of a recovery without intraocular complications. With the exception of 3 eyes in patients of over sixty years with partial cataract, in which I performed extraction with flap, after ripening (Foerster) and iridectomy, all the myopic lenses were operated on by discission followed by linear extraction with the angular keratome. The needling is made very extensive, and cocain, atropin, and ice-bags used locally in order to postpone extraction, if possible, until the lens has become entirely opaque and can be removed in toto. Irrigation of the anterior chamber is used freely. Secondary membranes are cut with Nicati's or Wecker's scissors. In 2 cases, glaucoma came on after the preliminary needling, but appropriate treatment, ice and mydriatics, soon reduced the tension to normal. In another case plus tension supervened whenever the atropin was stopped long enough for the pupil to contract and bring the iris in contact with the central area of the lens in which there was a protrusion of the opaque masses. It was not necessary in a single case to let out the swollen masses before they were completely opaque. In 8 cases there was incarceration of shreds of capsule or of vitreous in the corneal wound. These were easily severed with a sharp iris hook.

Cyst-Formation in the Conjunctiva.

By Dr. **THEODOR BALLABAN**, Lemberg.

Excluding cysticercus and congenital dermoids, simple serous subconjunctival cysts are rare, particularly those of the bulbar conjunctiva. Lymphangiectasies may simulate the above condition, and are not infrequent. While originally ascribed to injury (Arlt), it is now recognized that cysts generally form in pre-existing glands, the type of which can usually be recognized by the character and seat of the new growth.

1. Cysts of the Palpebral Conjunctiva.

These are infrequent, and may be due to rudimentary formations or anomalies of development. They may grow from Krause's or Henle's glands or be due to epithelial inclusion.

2. Cysts of the Fornix Folds.

This form may develop by retention in Krause's glands, occurring in either the upper or lower fold, and may be congenital or acquired. They vary in size from a hemp-seed to a pigeon's egg, and generally contain serous fluid, some coagulated albumin, and epithelial detritus. Another form develops in Henle's glands in consequence of repeated catarrhal inflammation leading to an occlusion of the efferent duct. They may form in places where glands are not usually situated. A large number of the cases of reported serous epithelial cysts probably belong to this category. Dermoids have also been found in the fornix folds.

3. Cysts of the Ocular Conjunctiva.

Normally, the human conjunctiva bulbi contains no true glands whose degeneration could give rise to cysts. If we exclude cystoid scars of the corneal limbus and congenital cyst-formations due to imperfect closure of the fœtal eye-cleft, conjunctival cysts on the globe are exceedingly rare. They are almost without exception lymph-cysts due to dilatation of lymph-channels. These may occur at any age and are usually multiple and small. The cyst wall consists of connective tissue with elastic fibres and a single layer of endothelium. A traumatic variety may be formed by epithelial

elements being carried underneath the surface by foreign body or in the course of a wound. Finally, congenital cystic nævi and cysts developing in pterygium have been reported, as well as a peculiar form ascribed by Rogman to adhesions of epithelial (conjunctival) folds, and by Ginsberg to the new formation of glandular tubes with inclusion, on the basis of repeated catarrhal inflammation. A special structure is shown by Parinaud's dermo-epithelioma of the bulbar conjunctiva and by Best's benign cystic epithelioma, which are very similar. These are usually congenital or acquired in early childhood, situated at the limbus, of yellowish-red color, translucent, often lobulated, and easily movable on the underlying tissue. They are made up of epithelial strands with cavities containing granular detritus or large cystic epithelial cells, some of them in a state of mucoid degeneration. I have recently had occasion to examine a cyst of this sort microscopically. It was undoubtedly caused by inclusion of solid epithelialc ones into the subepithelial tissue, followed by a breaking down of the central portions and the development of a bore or tube. This central degeneration can be seen in very young epithelial cones in the form of a hydropic change in the cells. Fluid may be absorbed from the neighboring tissues or secreted by the lining epithelium itself and so give rise to cystic dilatation. At all events it is evident that cysts may form in the conjunctiva without the medium of preexisting glands. In my case the epithelial proliferation was but slightly marked and could not be detected on many of the sections. The cystic nævi described by Wintersteiner were probably formations of this sort. Cysts in pterygia, on the caruncle, the semilunar fold, and other points where normally there are no glands are also probably due to epithelial inclusion on the basis of trauma, mechanical irritation, or catarrhal inflammation.

Telangiectatic Fibroma of the Conjunctiva.

By Dr. **RUDOLPH PADERSTEIN,** Strassburg.

In his article on polypoid growths of the conjunctiva, Elschnig has collected 13 cases of soft fibroma, of which 5 had

been studied microscopically. That clinical examination alone is insufficient to determine the character of these tumors is shown by the following case:

A young girl of seventeen was struck in the right eye by a twig. There was slight pain for a day. Four weeks later a small red mark appeared at the site of injury. This gradually increased in size, without causing any pain. On examination, about six months after the accident, a small, round, bluish-red tumor about half the size of a split pea was seen at the margin of the semilunar fold. It was quite soft, and with the conjunctiva to which it adheres could be moved over the sclera. The growth was excised, and the site of the development soon appeared normal. Examination of the specimen showed that it was composed of soft connective tissue with many capillaries and enlarged lymph vessels. The nucleus of the growth was rich in cells, and surrounded by a capsule. A hyaline, canalized substance was also found in the central part of the growth which, like the capsule, seemed to have some relation to the occurrence of endothelial or epithelial cells. The general structure of the growth resembled that of certain laryngeal fibromata. Radial fibrils and clefts in the hyaline substance of the capsule gave to the latter the appearance of the basal membrane of the respiratory nasal mucosa with its "basal canals" (Schiefferdecker). These canals in the tumor suggest a connection with lymph-channels. The portion of the capsule situated directly beneath the epithelium was of a fibrous structure. Clinically, the growth would be considered a polyp or cyst; and histologically, a soft fibroma. Two features of this group, pediculation and hemorrhage, were absent. The early stage of development may have had something to do with this feature. Growth of the tumor with traction on the subjacent tissue would probably have caused the development of a pedicle, and, considering the vascularity, hemorrhages would probably have appeared before long. The development of angiomata on the basis of trauma is well known, and confirmed by the history of this case.

Endarteritis of the Central Artery of the Retina with Concrement-Formation.

By Dr. **Z. GALINOWSKY**, Tula, Russia.

That obstruction of the central artery of the retina is by no means invariably due to embolism but is frequently caused by thrombosis with or without previous disease of the vessel wall, was first brought to the attention of ophthalmologists by Mauthner, Loring, Nettleship, later by Noyes and Priestley Smith, and of recent years by Haab and his pupils, as well as by Michel. It appears that proliferating endarteritis plays a prominent rôle, particularly in those cases in which complete obstruction of the vessel was preceded by transitory attacks of blindness. Michel claims that this factor alone without the formation of a thrombus may suffice to occlude the lumen of the central artery completely. Reimar comes to similar conclusions, and considers prodromata of obscurations pathognomonic of endarteritic proliferation. I have recently had occasion to examine a case in which the diagnosis of embolism had been made, and in which microscopic examinations showed that complete occlusion of the lumen was caused, not by thrombosis, but by calcification of the proliferating mass. Immediately behind the lamina cribrosa a marked proliferation of the intima of the central artery was found, about 1*mm* thick. This developed under the epithelium, spread around the wall of the vessel, and gradually reduced the calibre of the artery to $\frac{1}{4}$. The proliferation consisted of large cells rich in protoplasm, and of concentrically arranged fibres. A membrane of double contour formed a boundary line toward the narrowed lumen. At the point of greatest narrowing, outside the lumen of the vessel and enclosed in the cells of the proliferation, a chalky concretion was found. At the point of greatest diameter of this formation neither cells nor intima can be seen, and the vessel is enlarged to double its diameter. In front of the concrement, the lumen of the vessel, much narrowed, can again be detected, but the proliferation can be traced up to the lamina cribrosa. Peripherally the vessel contains some blood. As no blood could reach the retina through the central artery,

it is probable that a communication existed between the retinal circulation and the vessels of Zinn's plexus.

The clinical diagnosis of embolism of the central artery should not be made on the basis of the ophthalmoscopic examination alone. The general condition, and the state of the heart should be taken into consideration. In my case there was general rigidity of the arteries and a history of apoplectic attacks which strongly suggested local vascular disease. It must be conceded that a bit of degenerated vessel wall might be swept into the general circulation and form an embolus, or that a heart-thrombus formed on the basis of a valvular lesion might become disintegrated and be carried into the central artery of the retina, but such occurrences must be unusually rare. A further indication of vascular disease is given by the narrowing of the lumen of small vessels in the optic nerve and its sheaths, with a thickening of the elastica. Sudden blindness was followed by a temporary and partial recovery of vision. This was, perhaps, due to some shrinkage of the proliferating mass, but more probably to an increase of blood pressure and the relief of local spastic contraction of the occluded vessel. Final blindness was due not only to occlusion by proliferation, but to the chalky degeneration of the tissue. In small vessels which have no nutrient capillaries (vasa vasorum) this change seems to affect the intima first and most markedly. The region of the lamina cribrosa seems to be the favorite site for vascular disease. This depends on the circulatory conditions in the interior of the globe, the marked turns made by the vessels at the point of entrance of the nerve, and the mechanical traction of this segment when the eye is moved.

The differential diagnosis between thrombosis, embolism, and endothelial proliferation may be a very difficult matter if the histologic examination is made a long time after the occlusion of the vessel. Changes in the vessel wall, degeneration, contraction, organization of the obstructing mass, and reactive changes about it may entirely obscure the picture. A mass sufficiently large to cause an irregularity in the external wall of the vessel can, however, hardly be due to embolism, as it could not possibly have been carried into this position by the mere force of the blood-current.

REPORT OF THE MEETING OF THE OPHTHAL MOLOGICAL SOCIETY OF THE UNITED KINGDOM.

By Mr. C. DEVEREUX MARSHALL.

THURSDAY, MARCH 14, 1907. PRIESTLEY SMITH, F.R.C.S., PRESIDENT, IN THE CHAIR.

Dr. Rockliffe read notes of a case of **thrombosis of the cavernous sinus** associated with septic meningitis, which originated from a septic sore on the lip. The patient was a fish-dock laborer whose general health, but for bronchitic attacks, had been satisfactory. He was first seen on November 18th last and had proptosis of the right eye. Five days previously a small spot appeared on the upper lip. He picked it and eventually pricked it with a pin. The lip and face became swollen and he then applied a linseed-meal poultice. Four days later he was admitted into the infirmary. He became delirious, and a diagnosis of thrombosis of the cavernous sinus was made. Afterward lumbar puncture was done. He died on November 20th, being two days after admission, and seven days after the spot appeared on the upper lip.

At the autopsy the meninges about the right cavernous sinus were covered with lymph. The right cavernous, the transverse, and part of the left cavernous sinus were thrombosed. The orbital tissues on the right side were inflamed and swollen, but there was no pus.

Dr. Rockliffe also read notes of four cases of **sympathetic irritation** occurring after eighteen, twenty-two, twenty-eight, and fifty years respectively.

In two of these cases a foreign body was found, and the third case probably contained a foreign body, a piece of stone.

The injury in the fourth case was a punctured wound. Considerable ossification was present in three of the cases.

Mr. A. R. BRAILEY read a paper on **cysts of the pars ciliaris retinæ.** He stated that these structures had frequently been mistaken for sarcomata of the ciliary body clinically, but little was known of their pathology, though their study might throw some light on the secretion of the aqueous. They were found in such a variety of conditions that he was only able to classify them according to their apparent mode of origin. Two changes which played an important part in the origin of some varieties limited to the cells of the unpigmented epithelium were: multiplication of the cells, and vacuolation of the cell bodies. This proliferation was most frequently found in senile eyes, and was commonly associated with hypertrophy of the ciliary processes. The cells of the pigmented layer appeared to play a more passive rôle, and even in cysts arising by simple detachment of the epithelium, it was the unpigmented layer alone which was affected, the adhesion between the pigmented epithelium, and the underlying ciliary body being a peculiarly intimate one. The different modes of origin appeared to be: (1) Detachment of the non-pigmented epithelium. (2) Proliferation of the non-pigmented epithelium cells with the formation of a cavity arising either by simple separation of the cells, or by their vacuolation and destruction. (3) Proliferation and union of the cells of adjacent processes, leading to a portion of the posterior chamber being shut off from the remainder.

The number of the specimens was too small for him to come to any conclusion as to the relative frequency of these varieties. The contents of the cysts was usually lost during the preparation of the specimen, but when present it consisted of a deeply-staining, homogeneous, coagulable fluid.

SYSTEMATIC REPORT OF THE PROGRESS OF OPHTHALMOLOGY IN THE FIRST QUARTER OF THE YEAR 1906.

By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the Assistance of Prof. A. ALLING, New Haven; Prof. E. BERGER, Paris; Prof. CIRINCIONE, Genoa; Dr. DALÉN, Stockholm; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Mr. C. DEVEREUX MARSHALL, London; Dr. H. MEYER, Brandenburg; Dr. P. VON MITTELSTÄDT, Metz; Dr. H. SCHULZ, Berlin; Prof. DA GAMA PINTO, Lisbon; and Others.

Translated by Dr. PERCY FRIDENBERG.

Sections I.–III. Reviewed by PROF. C. HORSTMANN, Berlin.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

1. OPPENHEIMER, E. H. **Compend of glassing.** *Graefe-Saemisch Handbuch*, etc. Second edition, Pt. II., vol. iv.

2. VIRCHOW, HANS. **Microscopic anatomy of external tunics of the eye and of the lids.** *Graefe-Saemisch Handbuch.* Second edition, Part I., vol. i.

3. GREEFF, R. "Eye." *Orth's Text-Book of Special Pathological Anatomy.* Part 12.

4. HAAB, OTTO. **Atlas of external diseases of the eye.** *Lehmann's Med. Hand-Atlases*, xviii.

5. ISCHREYT. *Clinical and Histological Studies of Tumors of the Eye.* Berlin, 1906.

6. HOSCH. **Ophthalmological miscellanies.** *Arch. f. Augenh.*, liv., p. 156.

7. v. HIPPEL. **Further contributions to the study of rare malformations.** *Graefe's Arch. f. Ophth.*, lxiii., 1, p. 1.

8. STRAUB, M. *Text-Book of Diseases of the Eye.* Leyden, 1906.

9. KERN and SCHULZ. *Test-Types.* Second edition, Berlin, 1906.

10. HEIMANN, E. *Test-Types for Children.* Second edition, Berlin, 1906.

11. Roth, A. **Visual Tests.** *Quiz Compend.* Third edition, Leipsic, 1906.

12. Roth, A. *Confusion Tests.* Two Plates with Text. Leipsic, 1906.

13. Hirschberg, J. **Cataract operation according to Antyllos.** *Centralbl. f. prakt. Augenh.*, xxx., p. 97.

14. Hirschberg, J. **Contribution to the history of the cataract operation.** *Ibid.*, p. 133.

15. Liebreich, R. **Influence of visual defects on painting.** *Muenchn. Kunsttech. Blaetter*, 1906, No. 16.

16. Poullain, G. **Retrospective determination of the refraction of Jean Baptiste Porta.** *Rec. d' opht.*, xxviii., p. 1.

17. Truc, H. *The Evolution of Ophthalmology at the School of Montpellier.* Montpellier, 1905.

18. Pfalz. **First aid in injuries of the eye.** *Deutsche Militaer-Aerztl. Ztg.*, 1906, No. 4.

19. Junius. *Decisions of the Imperial Insurance Department of Importance to Oculists.* Berlin, 1906.

20. Feilchenfeld, W. **Earning capacity in injury to the eye.** *Zeitsch. f. Augenh.*, xv., 2, p. 216.

21. Bock, E. *Fifteenth Report of the Eye Department, County Hospital at Laibach*, 1905. Laibach, 1906.

22. Bouvin, M. J. *Report on the Eye Hospital at Gravenhagen for* 1905. Gravenhagen, 1906.

23. Knapp, H. *Thirty-sixth Annual Report New York Ophthalmic and Aural Inst.*, Oct. 1, 1904, to Oct. 1, 1905.

24. Parsons, J. Herbert. **Ehrlich's theory of immunity in its relationship to ophthalmology.** *Royal London Ophthalmic Hospital Reports*, vol. xvi., part 4.

25. Usher, C. H., and Frazer, Henry. **An analysis of a series of consecutive conjunctivitis cases seen in Aberdeen.** *Royal London Ophthalmic Hospital Reports*, vol. xvi., part 4.

In his sketch of the **science and art of fitting glasses,** Oppenheimer (1, Compend of glassing) reviews, first, the manufacture of lenses and frames, the construction of spectacles and eye-glasses, construction and use of monocles, reading glasses, lorgnons and lorgnettes. A second chapter deals with the different varieties of eye-glasses in regard to their application, and the principles of fitting and adjustment are detailed.

Hans Virchow (2, Microscopic anatomy of external tunics of the eye and of the lids) has taken charge of the chapter of **microscopical anatomy** of the **external covering of the eye and lids** which was the work of Waldeyer in the first edition of the Graefe-Saemisch handbook. The two last issues contain the

microscopical anatomy of the cornea, and deal with that of the corneal epithelium and of the cornea propria more particularly. The chapter has been entirely revised and completed. All the latest investigations are considered in extenso.

GREEFF'S (3, "Eye") description of the **pathological anatomy of the eye** deals in the last issue with diseases of the lids and lachrymal apparatus, completing this excellent work. The author's own investigations and complete survey of the literature make this by far the best treatise on the subject which has thus far appeared.

HAAB'S (4, Atlas of external diseases of the eye) **atlas of external diseases** of the eye appears in the third edition with numerous additions and improvements, and many new illustrations in color and black and white. A proof of its deserved popularity.

ISCHREYT (5, Clinical and histological studies of tumors of the eye) reports a number of **clinical observations** and histological investigations. Of the 20 cases reported, 17 were tumors of the eye and its appendages, while the remaining 3 were more or less closely situated. There were 3 cases of epibulbar carcinoma, 2 of xeroderma pigmentosum with tumor formation on the lids, 1 of primary carcinoma of the palpebral conjunctiva, 5 tumors of the lid commissure, 3 choroidal sarcomas, 1 carcinoma of a tarsal gland, 1 luetic tarsitis, 3 choked disk following orbital tumor, and 1 luetic mucous papule simulating tumor of the limbus.

HOSCH (6, Ophthalmological miscellanies) reports on **cyclitic membranes,** lipo-dermoid of the conjunctiva, fat-embolism of the retina, and on the etiology of zonular cataract.

V. HIPPEL (7, Further contributions to the study of rare malformations) describes **congenital teratoma of the orbit** congenital bilateral anophthalmia, with orbital encephalocele, cryptophthalmos, epibulbar dermoid, coloboma of the lid, and microphthalmos.

STRAUB'S (8, Text-book of diseases of the eye) handbook completes his two works on examination and therapeutics. **The pathology of the eye** is given in full. Refraction and accommodation, disturbances of light- and color-perception, then the diseases of the various tissues, and, finally, functional diseases are considered.

HEIMANN'S (10, Test-types for children) **test-types** present a black hand with outstretched fingers on a white ground. The juvenile patient is to say in what direction the hand points. It is not well adapted for quantitative determination of vision.

ROTH'S (11, Visual tests) **test-types** consist of two plates of Snellen's pot-hooks and are intended to detect simulation of visual diminution. The plates are hung side by side, and the lines of figures are at the same height. Reading over from one card to the other brings in a line of different size.

LIEBREICH (15, Influence of visual defects on painting) shows by a **study of Turner's paintings** that he was affected with lenticular opacities during the last twenty years of his life. Other painters show the effect of astigmatism and of color blindness in their technique and choice of pigments.

POULLAIN (16, Retrospective determination of the refraction of Jean Baptiste Porta) claims that the **discovery of the Galileian telescope** by Porta was induced by his hypermetropia. Kepler's invention of the astronomical telescope was aided by myopia.

PFALZ (18, First aid in injuries of the eye) urges **immediate grafting of epidermis** in cases of injury of the lids. Not a millimetre should be left to cicatrize. Burns of the lids, due to explosion, generally look worse than they are, except in case of laceration by foreign bodies. Pain is best controlled by a salve of airol, 1%, and holocaine, $\frac{1}{10}$%. Powder grains imbedded in the cornea and conjunctiva are to be removed only if they are quite superficial. Lime burns are to be treated with free irrigation. Contusions of the globe require pressure bandage, bed rest, and ice applications. Penetrating wounds are to be closed by scleral suture, and a bandage applied with oxy-cyanide of mercury, 1:5000. Iris prolapse with incarceration is the only injury requiring immediate operative interference.

FIELCHENFELD (20, Earning capacity in injury to the eye) finds that in many walks of industrial life **loss of one eye** and **deterioration of vision** do not interfere with full earning capacity. Each case must be studied individually, and a schematic valuation of loss of one eye is not advisable.

The difficulty of competing with normal individuals for employment, and the greatly increased seriousness of a second accident or of any further diminution of vision in the only remaining eye must, however, be taken into consideration, and compensation allowed for these factors.

Bock (21, Fifteenth report of the eye department, County Hospital at Laibach) treated 4555 patients, 173 in institutions. There were 13 cataract operations, 15 iridectomies, 48 squint operations.

Knapp (23, Thirty-sixth annual report New York Ophthalmic and Aural Inst.) treated 10,560 cases, performed 325 operations, 41 on the iris, 85 on the lens, and 45 on the muscles.

In this long and learned paper Parsons (24, Ehrlich's theory of immunity in its relationship to ophthalmology) goes into the whole question of **immunity.** He describes Ehrlich's theory, and refers to the work which has been done on the subject. Any one who is interested in the actions of toxins and antitoxins, and the theory on which they perform their work, cannot do better than to consult this paper, for it will save him hours of searching of original papers, mostly in the German language. It is however far too complicated to give an abstract which would be intelligible to those who know little or nothing of the subject.

Parsons then applies the theory to such cases as sympathetic ophthalmia, and brings forward strong evidence against the ciliary nerve theory of the disease. He discusses the action of bacteriolysins, opsonins, agglutinins, precipitins, and cytotoxins. The conjectures of Römer are given as to the causation of senile cataract deduced from the side-chain theory.

He finally expresses the opinion that the work which has been done on cytotoxins in general is the weakest part of the structure which has been built on the basis of the side-chain theory. Further researches will however, he thinks, eventuate in the discovery of some general principle underlying these complex problems.

Usher and Frazer (25, An analysis of a series of consecu-

tive conjunctivitis cases seen in Aberdeen) record an investigation upon the **clinical and bacteriological aspects** of a considerable number of cases of **conjunctivitis.**

As nutrient fluids, agar tubes were used in which was some body fluid—either ascitic, ovarian, or hydrocele, and in all these fluids were obtained from 9 individuals.

Of 3527 eye cases seen in 1905, 820 were cases of conjunctivitis, and this amounts to 23.24% of the eye cases.

Of the 820 cases, 310 proved to be due to the Koch-Weeks bacillus. These cases are carefully analyzed, and the clinical features are described.

Phlyctens were noted in 53 of the total number of cases, and in 36 the staphylococcus was also present. In 5 the Koch-Weeks bacillus only was found, and in 31 cases it was found in association with some other organism.

Several of the exceptional cases are fully described.

The medium found to be most suitable for these organisms was ovarian fluid. It should be recently obtained, and should contain 5 to 7% of albumin, and also blood derivatives, the presence of which can be proved by obtaining a spectrum of hæmochromogen. After being kept for six months, although sterile, ovarian fluid does not give satisfactory results with the Koch-Weeks bacillus.

Two hundred and seventy-four of the 820 patients examined were cases of diplobacillary conjunctivitis, due to the Morax-Axenfeld diplobacillus. In 34.7% of cases diagnosed as angular conjunctivitis, this bacillus was present, and the conclusion drawn was that angular conjunctivitis occurs in about one-third of all cases due to the diplobacillus, and when angular conjunctivitis is present, it is almost pathognomic of the presence of the diplobacillus.

In the same series of 820 cases, 21 were diagnosed clinically as gonorrhœal. Eighteen of these were found to be due to the gonococcus, one was due to the diplobacillus, and two to other forms.

Only one case of tuberculous conjunctivitis was seen, and that occurred in a girl aged seventeen and the diagnosis was clinched by inoculation. One case also was due to diphtheria.

One hundred and fourteen cases were left unclassed for

various reasons, when the condition present made the isolation of a specific organism unlikely.

There is no means of clinically diagnosing cases due to pneumococcus.

Trachoma was not met with in this inquiry.

Cases due to the Koch-Weeks bacillus occurred most frequently in the spring, while the diplobacillary cases were more numerous in the autumn, and, also, the greater the rainfall, the fewer the cases, and vice versa. Charts and photomicrographs accompany the paper.

II.—GENERAL PATHOLOGY, DIAGNOSIS. AND TREATMENT.

26. ALBRAND, W., and SCHROEDER, H. *The Pupil Post-Mortem.* Halle, 1906.

27. HESS, C., and ROEMER, P. **Experimental investigations on anti-bodies for the retinal elements.** *Arch. f. Augenh.*, liv., p. 13, 163.

28. v. MICHEL, J. **Occurrence of amyloid in the eye and ocular vessels.** *Zeitsch. f. Augenh.*, xv., p. 13.

29. RUHWANDEL. **Extensive remains of fœtal eye-vessels.** *Zeitsch. f. Augenh.*, xv., p. 245.

30. OGAWA, K. **Experimental study of wounds of the vitreous.** *Arch. f. Augenh.*, lv., 1–2, p. 91.

31. PIER, WM. **Cases of congenital and acquired pathological pigmentation of the eye.** *In. Diss.*, Giessen, 1906.

32. SCHIRMER, O. **Experimental and clinical study of phthisis bulbi.** *Deutsche med. Wochenschr.*, 1906, No. 20.

33. VOGT, A. **Studies on the deleterious action of anilin colors on the eye.** *Zeitschr. f. prakt. Augenh.*, xv., p. 1.

34. FERENTINOS. **Visual disturbance caused by observation of a solar eclipse.** *Ophth. Klinik*, 1906, No. 1.

35. DRAKE-BROCKMAN, C. F. **Is the use of electric light injurious to the human eye?** *Ophthalmoscope*, Oct., 1905.

36. KAHN. **The influence on intraocular tension of extracts of chromatin tissue.** *Zeitschr. f. Phys.*, 1906, No. 2.

37. SPEAR, E. W. **Photophobia, a nasal reflex.** *Boston Med. and Surg. Journ.*, 1906, No. 1.

38. RAMSAY, M. **Hydrophobic head tetanus due to contused wound of the external canthus.** *Ophthalmoscope*, Nov., 1905.

39. ORLOW, C. K. **The relation of the poison of rabies to the tissues of the eye.** *Westn. Ophth.*, 1906, No. 6.

40. MARSHALL, D. C. **Meningitis following enucleation.** *Ophthalmoscope*, Dec., 1905.

41. HERMJOHANNKNECHT, B. **On intraocular foreign bodies.** *In. Diss.*, Giessen, 1906.

42. VOSSIUS, A. **The importance of examination of the pupil in**

the diagnosis of unilateral blindness from lesion of the optic nerve. *Med. Wochenschr.*, 1906, No. 1.

43. PERGENS, E. **Studies in visual acuteness.** *Ann. d'oculist.*, cxxxv., pp. 11, 77.

44. LANGE, O. **Rejoinder to Wolf's diaphanoscopy.** *Klin. Monatsb. f. Aug.*, xliv., 1, p. 362.

45. COLLIN, R. **Clinical test of color sense.** *Zeitsch. f. Augenh.*, xv., 4, p. 305.

46. LANGE. **Symptoms and diagnosis of intraocular tumors.** *Vossius Sammlg.*, vol. vi., No. 7.

47. LANGE, O. *Diagnosis and treatment of external diseases of the eye.* Halle, 1906.

48. SCHMIDT-RIMPLER, H. **Mercury treatment in ophthalmic medicine.** *Deutsche med. Wochenschr.*, 1906, No. 1.

49. HIRSCH, G. **Painless hypodermic injections of mercury.** *Med. Klinik*, No. 9, 1906.

50. GELPKE. **On the therapeutic value of yellow oxide ointment.** *Vossius Sammlg.*, vol. vi., No. 6.

51. LIPPINCOTT. **Intraocular irrigation.** *Ophthalmology*, 1906, p. 226.

52. BECK, A. **On subconjunctival salt-injections.** *Arch. f. Aug.*, liv., 4, p. 368.

53. STARGARD. **Necrosis after suprarenin injections.** *Klin. Monatsbl. f. Augen.*, xliv., 1, p. 213.

54. REUCHLIN, H. **Experiences with Koch's tuberculin.** *Ibid.*, p. 358.

55. RENNER. **On Bier's hyperæmia in eye diseases.** *Muench. med. Wochen.*, 1906, 2.

56. GROSSE. **Asepsis of instruments, bandage-materials, and drugs in ophthalmic surgery.** *Ibid.*, p. 219; *Klin. Monatsbl. f. Aug.*, xliv., 1.

57. FICK. **Ciliary neurotomy without injury to the optic nerve.** *Zeitsch. f. Augenh.*, xv., p. 51.

58. TUERK. **The technique of the magnet operation.** *Arch. f. Aug.*, liv., 2, p. 180.

59. SCHOLTZ, K. **Determination of the value of jequiritol by animal experiment.** *Ibid.*, lv., 3, p. 209.

60. SUKER, G. F. **Two cases of intraocular tumor in which the trans-illuminator was misleading.** *Oph. Record*, Nov., 1906.

61. LEWIS, E. P. **A practical method of abolishing the cause of one-quarter of the unnecessary blindness in the United States.** *Jour. Amer. Med. Asso.*, April 28, 1906.

62. VERDERAME. **Subconjunctival injections.** *Zeitschr. f. Aug.*, xv., 4, p. 289.

ALBRAND and SCHROEDER (26, The pupil post-mortem) describe the **pupillary reaction** after certain forms of **poisoning,** post-mortem changes, the direct and indirect action of poisons

on the pupil, and the combination of toxic and lethal pupillary reaction. The mydriatic and meiotic action of poisons is detailed. The pupil in alcohol intoxication, asphyxia, and collapse is then taken up. Results of animal experiments and reports of clinical cases are given. The last chapter describes pupillograms, the pupil in death by decapitation, the cause of premortal dilatation, and the cadaveric pupil as it varies under high and low temperatures.

Hess and Roemer (27, Experimental investigations on anti-bodies for the retinal elements) proved that the normal sera of various species contain anti-bodies for the rods and cones not only of other varieties but even for the same individual.

v. Michel (28, Occurrence of amyloid in the eye and ocular vessels) examined the eyes of a girl of eighteen in whom a double, almost **complete hemorrhagic detachment** of both retinæ had been observed eighteen hours before death. Autopsy showed contracted kidney with extreme amyloid degeneration. The same reaction was found in the chorio-capillaris, retinal vessels, and those of the nerve. Local amyloid may be found without constitutional degeneration in scars, staphylomata, and ribbon-shaped opacity of the cornea; as a result of hemorrhages into the vitreous; in the walls of choroidal and retinal vessels in phthisis bulbi.

Ruhwandel (29, Extensive remains of fœtal eye-vessels) describes conditions in the eye of a man of thirty-one which are taken to represent remains of the **fœtal vascular system.** The hyaloid artery was persistent not only in its trunk but also in a large part of the original zone of distribution on the posterior capsule of the lens.

According to Ogawa (30, Experimental study of wounds of the vitreous) a **wound of the vitreous** cannot be healed. It is a division of continuity which cannot be restored. There is no evidence of regeneration or of cicatrization or of proliferation of blood-vessels. Strands never form in the vitreous. The puncture is filled with fluid vitreous only. The walls of the wound canal consist simply of neighboring vitreous tissue which is mechanically thickened or condensed. This condensation may become looser in time.

Leucocytes which immigrate into the vitreous after injury gradually become less numerous.

PIER (31, Cases of congenital and acquired pathological pigmentation of the eye) reports 5 cases of **albinism**, a case of pigmented corneal scar with incarcerated iris, following injury, 4 cases of pigmentation of the entire bulbus after trauma, 4 cases of pigmentation of the sclera after penetration by the nib of a steel pen, and 3 cases of peculiar discoloration following scleritis.

The investigations of SCHIRMER (32, Experimental and clinical study of phthisis bulbi) go to show that **inflammatory disturbances** of circulation are the cause of **lowered tension** often observed a few hours after the onset of acute inflammation. Aqueous of high albumin concentration is secreted in very small quantity. This inflammatory change in vascular secretion may last for months with lowered tension and then disappear, when tension returns to normal. In cases terminating unfavorably, so many ciliary vessels are destroyed that not enough are left to secrete sufficient intraocular fluid. The aqueous may then be of normal concentration and albumin percentage but it is deficient in quantity. Intraocular tension is permanently reduced, the capsule of the globe is no longer under elastic tension, and the tissues contract of their own accord and become thickened: non-irritative phthisis. If a larger number of vessels escape destruction, highly concentrated aqueous is secreted as before, in too small a quantity, and phthisis dolorosa results.

VOGT (33, Studies on the deleterious action of anilin colors on the eye) finds that various **anilin colors** have different **effects on the tissues of the eye,** depending on their chemical composition. Acid, neutral, and mordant colors, and those which are insoluble in water, cause little or no irritation when introduced into the conjunctival sac of the rabbit in amounts of 5–10*mg*. Basic pigments in similar quantities cause intense irritation which may go on to panophthalmitis. This is proportional to the basicity and does not depend on the mineral acid of the color-salt; increases with the solubility of the pigment in the fluids of the eye. Irrigation of the conjunctival sac with 5–10% solutions of tannin neutralize even the most active anilin colors while water and solutions of salt,

boric acid, bichloride, or soda bicarbonate seem to do more harm than good.

FERENTINOS (34, Visual disturbance caused by observation of a solar eclipse) describes the **fundus conditions** of 5 patients who had watched a **solar eclipse** with unprotected eyes, and suffered diminution of vision in consequence. At the centre of the macula a red spot was seen of the size of a lentil, in which there was a gray dot of the size of a pin-head. Central scotoma and retinal asthenia were noted. In the course of time all these symptoms disappeared.

DRAKE-BROCKMAN (35, Is the use of electric light injurious to the human eye?) reports 6 cases which show that **electric light** as it is ordinarily used for interior illumination is a source of sensitiveness of the eye and may be **dangerous and injurious.** In all these cases the symptoms disappeared after oil or gas lamps were substituted for electricity. We are still ignorant of the kind of light-rays which cause the trouble.

According to KAHN (36, The influence on intraocular tension of extracts of chromatin tissue), **intravenous injections** of **adrenalin** raise intraocular tension more than 50% above its original height. This is due to passive dilatation of the vessels of the eye depending on contraction in the general vascular system and increase of blood-pressure. The latter is lowered sooner than the tension within the eye.

SPEAR (37, Photophobia, a nasal reflex) considers the possibility of **hyperæsthesia of the nasal mucosa** being a cause of **photophobia,** and cites cases to prove this theory.

RAMSAY'S (38, Hydrophobic head tetanus due to contused wound of the external canthus) patient was a woman of twenty-three who had been struck on the right eye with a walking-stick four days previously. There was a suppurating wound near the external canthus with chemosis of marked degree. A few days later trismus set in which gradually got worse. All the muscles of the injured side of the face were paralyzed. Tetanus bacilli in large numbers were found in the wound. Anti-tetanus serum was administered and sleep produced by large doses of chloral. After the third dose of anti-toxin the condition began to improve and the patient finally got well. Most of these cases end fatally, and the

favorable result in this case was probably due to the serum treatment. Altogether, 150 *c.c.* were given, in 7 doses. In the course of about 5 weeks, 3000 grains of chloral were taken, about 150 grains being given every 24 hours for the first 16 days.

Orlow (39, The relation of the poison of rabies to the tissues of the eye) studied the action of **rabies poison** on the **tissues of the eye** by animal experiments on rabbits and guinea-pigs. Different tissues of the eye were used to form an emulsion for inoculation, the animals from which these tissues were taken having been killed by inoculation with artificially isolated tetanic virus. The toxic emulsion was introduced under the meninges of animals. Retina and vitreous were found to be as virulent as the medulla oblongata. The local changes in the eye preceding death by rabies are in the nature of chorio-retinitis. The virus is found in the retina, the vitreous, optic nerve, and aqueous.

Marshall (40, Meningitis following enucleation) energetically opposes the view of many ophthalmologists that it is dangerous to remove an eye in the stage of **florid panophthalmitis.** He claims that the meningitis which has been observed in such cases is not due to the enucleation, but to the fact that it had not been performed in time. Meningitis had already developed although its symptoms were not pronounced or not recognized. He cites cases in which death took place of meningitis although no operation was performed, but has not seen a single case in his long practice in which death could justly be attributed directly to enucleation. The great majority of patients would get well without any complications if the eyes were removed in time. Early operation is imperative and should be performed as soon as it is evident that there is pus in the interior and that there is no probability of regaining useful vision.

Hermjohannknecht (41, On intraocular foreign bodies) gives statistics from the eye-clinic at Giessen of 58 patients, 62 eyes, treated for **intraocular foreign bodies.** In 4 cases both eyes were injured by dynamite or powder explosion. The patients were mostly miners and stone-quarry workers. Iron and steel splinters were most frequent. The foreign body was

found in the vitreous 25 times. In 20 cases extraction was successful; in 14, the globe had to be enucleated or eviscerated, and in 6 cases phthisis bulbi resulted.

Vossius (42, The importance of examination of the pupil in the diagnosis of unilateral blindness from lesion of the optic nerve) calls attention to the **examination of the pupil** in case of **monocular blindness** following injury of the optic nerve. The pupil of the blind eye dilates ad maximum when the sound eye is covered, and contracts when light enters the good eye. This together with dilatation of the pupil of the blind eye in spite of light stimulus proves that light conduction by way of the nerve of the injured eye is completely abolished.

Pergens (43, Studies in visual acuteness) gives a **historical review** of the literature on **visual acuteness** and the tests for it. The camera obscura was known before Porta, who is generally believed to be the inventor. Before Scheiner, Aranyi demonstrated the reversal of images on the retina, and both probably had this phenomenon shown them in Rome by an unknown scientist. Keppler was antedated by Plater who in 1583 gave a correct demonstration of the refraction of light rays in the eye.

Collin (45, Clinical test of color sense) recommends **colored glasses** illuminated by an electric lamp and attached to the perimeter, for the determination of central color perception and the color fields.

Schmidt-Rimpler (48, Mercury treatment in ophthalmic medicine) uses **mercury in ophthalmic therapeutics** in the form of inunctions or of intra-muscular injections of bichloride, in all syphilitic affections and especially in diseases of the iris, irido-cyclitis with vitreous opacities, and choroiditis.

Hirsch (49, Painless hypodermic injections of mercury) recommends for **hypodermic injections of mercury,** a preparation which contains 1% hydrarg. oxycyanate and 0.5% acoin in aqueous solution. This is free from pain and the point of injection remains free from tenderness and irritation.

According to Gelpke (50, On the therapeutic value of yellow oxide ointment) **yellow oxide ointment** has a double action, being both an antiseptic and an absorbent.

Its application is especially desirable in those forms of blepharitis which are complicated with chronic catarrh of the conjunctiva, as well as in the terminal stages of phlyctenular conjunctivitis. It is contra-indicated in case the cornea is also affected in phlyctenular and in all other forms of keratitis. In episcleritis it is of value. Gelpke warns against using this medicament in a stereotyped way without individualizing, and believes that much harm is done by its too general and promiscuous use.

LIPPINCOTT (51, Intraocular irrigation) traces the history of **irrigation** from St. Yves, who in 1722 washed out the anterior chamber for hypopyon, to its renascence due to McKeown and Inouye. France and America have taken up the procedure as a valuable aid in the removal of cortical remnants in cataract operation. It may still be employed to advantage in hypopyon, complicated, as Lippincott at times has found it, by small non-metallic foreign bodies such as coal or shale which have penetrated into the anterior chamber in mining accidents. Even when no foreign body is present, irrigation is a valuable aid in the determination of that fact. In cataract operation, the advantages of irrigation are those of a thorough, prompt cleansing of the anterior and posterior chambers and the lips of the wound of cortical matter, blood, air bubbles, and shreds of capsule, by absolutely gentle means. It clears the field and so conduces to accurate capsulotomy. The pupil becomes clear after extraction, and the patient is encouraged. The iris is stimulated to return to its normal position. It makes prolonged stroking and pressing on the cornea unnecessary and will re-establish the anterior chamber and the form of the corneal dome in case of collapse or inversion of that membrane. The remote advantages are at least as important. Rapid union is favored by accurate coaptation of the wound edges, there is less tendency to prolapse, and to capsular opacities, so that secondary operation is not so often required. It diminishes the danger and severity of uveal inflammation due to retained matter. It is not necessary when the lens emerges in its capsule, and is contra-indicated in actual or threatened escape of vitreous. Its effectiveness is best demonstrated when cortex is soft or unduly adherent, in traumatic and immature cataract, myopic choroidal cataract,

and high myopia. Physiological salt solution is almost universally acknowledged to be the best fluid for irrigation. Lippincott has devised a fountain syringe with pen-holder handle. It is easily disinfected, does not carry air bubbles into the anterior chamber, is simple, controllable with one hand, and the amount and force of the fluid can be regulated.

Beck (52, On subconjunctival salt-injections) found that **subconjunctival injections of salt-solution** were followed by decided improvement in 4 out of 5 cases of vitreous opacities, 7 out of 8 of central choroiditis, in 1 case of injury, 1 of sympathetic ophthalmia, and 1 of detachment.

Stargard (53, Necrosis after suprarenin injections) injected a solution of **cocain-adrenalin,** containing 7.5 parts of a 1% solution, and 2.5 parts of a 1:1000 solution, respectively, in two cases. The entire area of infiltration became necrotic.

Reuchlin (54, Experiences with Koch's tuberculin) claims that a **typical reaction** to small amounts (1–3–5*mg*) of **old tuberculin** in a patient whose eye disease is suspected to be dependent on tuberculosis proves the presence of an active tuberculous process, even if there is no evidence of tuberculosis elsewhere. There was a positive reaction to tuberculin in 9 cases out of 11 of phlyctenular conjunctivitis, typical reaction in 4 more cases of scrofulous ophthalmia, and in 6 cases of typical parenchymatous keratitis. In 2 of these, tuberculin treatment was employed with success, and in 5 cases of choroidal disease. Probatory injections were made in 30 cases of disease of the iris and ciliary body, with a positive reaction in 27.1; eighteen were treated with injections, 14 successfully. Considering the excellent results in these cases, the author urges more general use of systematic tuberculin injections, which are entirely harmless although they require much patience on the part of both physician and patient.

Renner (55, On Bier's hyperæmia in eye diseases) used Bier's congestive hyperæmia in 5 cases of parenchymatous keratitis affecting individuals up to forty years of age, with marked improvement in all. The result in a case of serpent ulcer was satisfactory. On the other hand, there was no

notable improvement in cases of eczemato-phlyctenular and catarrhal ulcer, or in old corneal ulcers without vascularization.

GROSSE (56, Asepsis of instruments, bandage-materials, and drugs in ophthalmic surgery) recommends his universal steam sterilizer for asepsis of instruments, bandage material, and solutions for eye operations.

FICK (57, Ciliary neurotomy without injury to the optic nerve) reports 2 cases in which cyclitic irritation was arrested by ciliary neurotomy without implication of the optic nerve.

TUERK (58, The technique of the magnet operation) advises the use of large, powerful magnets acting at a distance from the eye in case of metallic foreign bodies, particularly as long as they are located in the depths of the eye.

SCHOLTZ (59, Determination of the value of jequiritol by animal experiment) shows experimentally that very small amounts of jequiritol-serum neutralize jequiritol completely, prevent or cure jequiritol ophthalmia, and exert a protective action for a long time.

SUKER (60, Two cases of intraocular tumor in which the transilluminator was misleading) demonstrates the fact that this instrument cannot be depended upon in diagnosis of intraocular tumors when the vitreous is permeated with blood. He presents two specimens in one of which the transilluminator failed to show the slightest shadow on account of the presence of blood. ALLING.

LEWIS (61, A practical method of abolishing the cause of one-quarter of the unnecessary blindness in the United States) offers a strong plea for the general dissemination of knowledge concerning the dangers of ophthalmia neonatorum, and suggests that the health department of every State arrange for the free distribution of properly prepared solutions of silver nitrate with complete directions for their use. ALLING.

VERDERAME (62, Subconjunctival injections) warns against subconjunctival injections of acoin and of mercurial salts on account of the irritation, which may even cause necrosis and obliteration of the conjunctival sac. In exudative inflamma-

tion, subconjunctival injections of salt-solution have an excellent effect in promoting the absorption of exudates. They may be used in 2–10% solution without causing any damage.

III.—REMEDIES AND INSTRUMENTS.

63. HINSHELWOOD. **Argyrol in ophthalmic practice.** *Ophthalmoscope*, 1906, No. 1.

64. SPENGLER. **A danger of argyrol.** *Zeitsch. f. Augenh.*, xv., p. 44.

65. STEINKUEHLER, M. **Protargol.** *Wochensch. f. Ther. u. Hyg. d. Aug.*, 1906, No. 6.

66. BYLSMA. **Defense of protargol.** *Med. Weekbld.*, 1906, March 23.

67. MEYER. **Further report on Crede's silver treatment.** *Centralbl. f. prakt. Augenh.*, xxx., p. 433.

68. SAGER D. S. **The action of formaldehyde on the cornea.** *Ophthalmoscope*, 1906, Feb.

69. BINDER. **Use of aristol in ophthalmology.** *Ther. d. Gegenw.*, 1906, No. 6.

70. KRAUSE, R. **Action of chrysarobin on the eye.** *Zeitsch. f. Augenh.*, xv., 3 p. 233.

71. TERSON. **Guaiacol in ophthalmic practice.** *Ophth. Klinik*, 1906, 2.

72. NEUSTAETTER. **Incrustation by hydrogen peroxide.** *Ophth. Klinik, ibid.*

73. KOSTER. **Potassium chlorate in ophthalmic practice.** *Tydsch. voor Geneesk.*, 1906, No. 6.

74. SCRINI. *Local Anæsthesia with Alkaloids in Oily Solution.* Paris, 1906.

75. LIEBL. **Local anæsthesia with novocain-suprarenin.** *Muenchn. med. Wochensc.*, 1906, No. 5.

76. FOERSTER. **Dionin and atropin.** *Wochens. f. Hyg. u. Ther. d. Aug.*, 1906, p. 145.

77. DEUTSCHMANN. **Use and abuse of atropin.** *Med. Woche.*, 1906, Nos. 5, 6.

78. HINSHELWOOD. **Dionin in ophthalmic practice.** *Brit. Med. Jour.* '06, No. 2367.

79. GEBB. **Novocain and its anæsthetic action on the eye.** *Arch. f. Aug.*, lv., p. 122.

80. TRUC. **Alypin in ophthalmic practice.** *Rev. gén. d'opht.*, xxv., p. 97.

81. STEPHENSON, S. **Note on alypin, a new anæsthetic.**

82. JAQUES, R. **Alypin, a new anæsthetic.** *Ophthalmoscope*, Nov., 1905.

83. SUKER, G. J. **Scopolamine-morphine anæsthesia in ophthalmic practice.** *Medicine*, Jan., 1906.

84. SANTOS, FERNANDES J. **Stovaine in operation for entropion of the lower lid.** *Rev. gén. d'opht.*, xxv., p. 99.

85. Adam. **Apparatus for determining the amplitude of accommodation.** *Centralb. f. prakt. Augenh.*, xxx., p. 16.

86. Borschke, A. **Simple method for determining stereoscopic vision.** *Centralblatt. f. prakt. Augenheilk.*, xxx., p. 147.

87. Ohm, T. **Binocular pupillometer.** *Centralb. f. prakt. Augenh.*, xxx., p. 147, 129.

88. Diley, C. W. **Instrument for the determination of the centre of a lens.** *Ophthalmoscope.*, Dec., 1905.

89. Ulbricher, H. **Improvement of Berger's binocular loupe.** *Prager. med. Wochens.*, 1906, No. 21.

90. Perlmann, H. A. **A new holder for the illuminating lens.** *Arch. f. Aug.*, lv., 3, 287.

91. Armaignac. **An auto-synoptometer.** *Acad. de Méd.*, 1906, Jan. 9.

92. Weiss, K. E. **The metallophon, for the detection of metallic bodies (even if not iron) in the eye.** *Centralbl. f. prakt. Aug.*, xxx., p. 100.

93. Oppenheimer. **On lenses of novel construction.** *Klin. Monatsbl. f. Augenh.*, xliv., 1, p. 250.

94. Publitz. **Pipette-bottle for eye-drops.** *Arch. f. Aug.*, liv., 2, 182.

95. Albrand, W. **Warmable eye-douche.** *Centralbl. f. prakt Augenh.*, xxx., p. 148.

96. Stephenson, S. **Improved thermocautery for ophthalmic practice.** *Ophthalmoscope*, Dec., 1905.

97. Peters, A. **Suction apparatus after Bier-Klapp in place of Heurteloup's artificial leech.** *Ophth. Klinik.*, 1906, No. 4.

98. Todd, F. C. **Some new foreign-body instruments.** *Ophth. Rec.* May, 1906.

99. Würdemann, H. V. **Transillumination of the eye in the differential diagnosis of intraocular tumors, with description of an ocular illuminator.** *Ophth. Rec.*, May, 1906.

100. Hull, E. A. **Movable artificial eye.** *Northwestern Medicine*, Sept., 1906.

101. Wilder, W. H. **Paraffin plates as an aid in operations for extensive symblepharon.** *Jour. Amer. Med. Asso.*, Aug. 25, 1906.

102. Duane, A. **A tangent plane for accurately mapping scotomata and the field of fixation and single vision and for indicating the precise position of double images in paralysis.** *Ophth. Rec.*, Oct., 1906.

103. Bruns, H. D. **The immersion treatment with argyrol solutions of the purulent ophthalmias.** *Ophth. Rec.*, Dec., 1906.

104. Stevenson, M. D. **Instrument with which powder may be readily introduced into the anterior chamber of the eye.** *Ophth. Rec.*, Oct., 1906.

105. Stauffer, F. **A successful operation for conical cornea.** *Ophth. Rec.*, May, 1906.

106. Baker, A. R. **The use of the electric magnet and X-ray in removing foreign bodies from the eye.** *Ophth. Rec.*, June, 1906.

HINSHELWOOD (63, Argyrol in ophthalmic practice) calls attention to the fact that **argyrol** is free from irritating properties, even in 20–30% solution. Its action is decidedly soothing. Solutions should be freshly prepared or they irritate, without, however, becoming inactive. In conjunctivitis and affections of the lachrymal passages this drug is especially valuable.

SPENGLER (64, A danger of argyrol) finds **argyrol** the least irritating of all silver salts. It may be applied in 20–30% solutions. In syringing out the lachrymal passages in the presence of small tears and fissures in the tissues, argyrol may cause a slaty discoloration of the conjunctiva.

STEINKUEHLER (65, Protargol) advises the preparation of **protargol solutions** with cold water and immediately before using, as they are otherwise apt to cause irritation with pain and lachrymation.

MEYER (67, Further report on Crede's silver treatment) recommends **collargol** in 5% solutions for purulent conjunctivitis, blennorrhœa, and even trachoma.

SAGER (68, The action of formaldehyde on the cornea) dropped a 40% solution of **formalin** into an eye by accident. It was washed out as quickly as possible. For 3 or 4 hours there were no untoward symptoms, but then œdema of the lids set in and the eye was almost closed. There was marked chemosis. Six months later there was a smoky opacity of the cornea. Vision, about $\frac{20}{40}$. The eye was otherwise normal.

BINDER (69, Use of aristol in ophthalmology) recommends aristol oil in phlyctenular conjunctivitis and keratitis, blepharitis, erosions of the cornea, burns and injuries of the conjunctiva.

KRAUSE (70, Action of chrysarobin on the eye) saw three cases in which the use of **chrysarobin** for a skin affection was followed by conjunctivitis. There were corneal complications in two.

TERSON (71, Guaiacol in ophthalmic practice) finds that **guaiacol** is borne better than the fluid preparation from creosote. It may be used as an antiseptic, alterant, anæsthetic, analgetic, and antipyretic.

After the use of 3% solutions of **hydrogen peroxide,** NEUSTAETTER (72, Incrustation by hydrogen peroxide) observed the appearance of sharply defined intensely yellow white spots on the conjunctiva. They appeared one minute after the instillation and disappeared completely within an hour.

KOSTER (73, Potassium chlorate in ophthalmic practice) uses 3% solutions of **chlorate of potash** with good results in the treatment of catarrhal conjunctivitis, particularly the chronic type with corneal ulcerations.

SCRINI (74, Local anæsthesia with alkaloids in oily solution) recommends the use of **alkaloids** in **an oily vehicle.** The application is simple and agreeable. The action is more rapid, more intense, and lasting than that of aqueous solutions. Blepharospasm and lachrymation are never seen. The solutions keep well and are not easily decomposed. They are aseptic and remain so.

LIEBL (75, Local anæsthesia with novocain-suprarenin) finds that **novocain** may supplant cocaine, and works well in combination with adrenalin.

DEUTSCHMANN (77, Use and abuse of atropin) warns against the **unnecessary** and **prolonged use of atropin.** Permanent impairment of accommodation, glaucoma, and irritation of the conjunctiva are the principal dangers.

HINSHELWOOD (78, Dionin in ophthalmic practice) recommends **dionin** as an **analgesic** in cases of irritability and hyperæsthesia of the eye, as well as for the purpose of clearing up opacities.

GEBB (79, Novococain and its anæsthetic action on the eye) praises the **anæsthetic action** of **novocain.** It is completely soluble in an equal amount of water. A 5–10% solution dropped into the eye causes anæsthesia in 3–5 minutes, lasting an hour or more. There may be slight irritation and congestion of the ocular conjunctiva. The pupil may be slightly dilated, but accommodation is not affected. The toxicity is 5 or 6 times less than that of cocain. The anæsthetic action is slightly less marked than that of cocain.

STEPHENSON (81, Note on alypin, a new anæsthetic) discusses the anæsthetic action and good and bad points of **cocain and**

alypin. The latter is to be preferred as it does not affect the pupil or accommodation, is half as toxic, and does not injure the corneal epithelium.

JAQUES (82, Alypin, a new anæsthetic) agrees with the last named author. The anæsthetic action of **alypin** is perfect. It produces slight dilatation of vessels.

SUKER (83, Scopolamin-morphin anæsthesia in ophthalmic practice) found that injections of **scopolamin,** gr. $\frac{1}{100}$, and **morphin**, gr. $\frac{1}{2}$, were followed by anæsthesia, muscular relaxation, and partial unconsciousness. Complete narcosis could then be induced with very small quantities of ether or chloroform. He advises its more general use in operations for glaucoma, cataract in restless patients, and enucleation.

The **instrument** devised by DILEY (88, Instrument for the determination of the centre of a lens) is intended to mark the **optical centre** of a lens. A stenopaic disk, a glass plate marked with a cross, and a wooden cross are combined so that they are accurately centred. If a lens be introduced this is disturbed, unless the centre of the lens is exactly opposite the intersection of the cross marks. The wood cross is movable so as to be used for the determination of the axis of cylindrical lenses.

ULBRICHER (89, Improvement of Berger's binocular loupe) has **improved Berger's loupe** by the addition of a lateral opening into the dark chamber, and by the attachment of changeable magnification.

PERLMANN (90, A new holder for the illuminating lens) has devised an **instrument** which allows the **lens to be held** in the **mouth** during local illumination and moved in any direction.

ARMAIGNAC'S (91, An auto-synoptometer) synoptometer is devised to test the presence of **alleged monocular blindness.** The visual acuteness of either eye can be determined without the patient knowing which eye is being tested.

OPPENHEIM (93, On lenses of novel construction) describes a **bifocal** lens, made by Struebin in Basle, for aphakial eyes, consisting of a lens cemented inside an ordinary convex lens.

ALBRAND'S (95, Warmable eye-douche) **heatable eye-douche** is a glass vessel like the ordinary nasal douche with a thermometer and a device for heating the solution for irrigation of the conjunctival sac.

Stephenson's (96, Improved thermocautery for ophthalmic practice) instrument is a modification of Beach's **thermocautery.** It is made small and handy for ophthalmic practice.

Peters's (97, Suction apparatus after Bier-Klapp in place of Heurteloup's artificial leech) apparatus is a small **cupping glass** with a rubber bulb which is to be placed on the temple.

Todd (98, Some new foreign-body instruments) finds an instrument made **V-shaped** in section useful in removing bits of metal embedded in the cornea.

Alling.

The **illuminator** described by Würdemann (99, Transillumination of the eye in the differential diagnosis of intraocular tumors, with description of an ocular illuminator) seems to be an improvement upon those in use because it is scarcely larger than a fountain pen and does not get hot. It somewhat resembles in construction the transilluminator employed for diagnosis of empyema of the frontal sinus.

Alling.

Hull (100, Movable artificial eye) makes a **circular incision** with the scissors just posterior to the ciliary region and in front of the insertion of the recti muscles. He then removes the contents of the globe, pierces the sclera with a sharp-pointed scissors, and severs the nerve *20mm* behind its juncture with the eyeball. The sclero-optic juncture is then excised leaving a zone of sclera to which the muscles are attached. It is nourished by a few twigs of the short posterior ciliary and long posterior ciliary arteries. A gauze drain is inserted for a few hours. A movable pad is thus formed upon which an artificial eye will rest. Alling.

Wilder (101, Paraffin plates as an aid in operations for extensive symblepharon) advocates **paraffin plates** for holding mucous or Thiersch grafts in place because they can do no harm to the cornea and can be built up to fit any conjunctival cul-de-sac. The graft adheres smoothly and evenly to the paraffin and no sutures are required. The sac may be cleansed by means of holes through the plates. Alling.

Bruns (103, The immersion treatment with argyrol solutions of the purulent ophthalmias) instills **argyrol** in cases of purulent conjunctivitis every fifteen to thirty minutes con-

tinuously until the discharge ceases, using no other treatment. He claims that the disease is cut short and its severity lessened. Complicating corneal lesions are very uncommon and when occurring are less serious. ALLING.

STEVENSON'S (104, Instrument with which powder may be readily introduced into the anterior chamber of the eye) instrument consists of a **tubular container** into which the powder is introduced and from which it may be forced, after the instrument is in the anterior chamber by pressure on the piston rod in the handle. He prefers iodol powder. ALLING.

STAUFFER (105, A successful operation for conical cornea) excised an **elliptical piece of the cornea** in an advanced case of keratoconus. He passed two sutures before making the incisions, the first of which was made with a Graefe knife and the operation was then completed with the scissors. ALLING.

BAKER (106, The use of the electric magnet and X-ray in removing foreign bodies from the eye) uses both the **large and small magnet** but believes that a medium-sized magnet could be constructed to do all that can be done with the giant. He finds the sideroscope of no service, but uses X-ray in all cases. He has had no better result when the foreign bodies have penetrated the sclera, even though not involving the ciliary region, than when through the cornea, iris, and lens. The prognosis for saving the eyeball largely depends on whether the foreign body is infected or not. Of patients who come with foreign bodies in the posterior half of the eyeball 50% would be a fair estimate of those retaining some vision, and 25%, of those preserving a cosmetically good eyeball. ALLING.

Sections IV.–VII. Reviewed by DR. ABELSDORFF, Berlin.

IV.—ANATOMY.

107. LEVINSOHN, G. **The posterior limiting layers of the iris.** *v. Graefe's Arch. f. Ophth.*, lxii., 3, p. 547.

108. FLEISCHER, R. **The development of the lachrymal canaliculi in mammals.** *Ibid.*, lxii., p. 379.

109. KRUECKMANN, E. **Embryology and development of support-**

ing tissue in the optic nerve and retina. *Klin. Monatsb. f. Aug.*, xliv., 1, p. 162.

110. Blaauw, E. E. **The anatomy of the eye according to the ancients.** *Ophthalmology*, Oct., 1905.

111. Loeb, C. **Some cellular changes in the primary optic vesicle of Necturus.** *Annals of Ophth.*, Jan., 1906.

Levinsohn (107, The posterior limiting layers of the iris) has examined irides of apes and man, and distinguishes a double layer of pigment-epithelium and a layer above it, composed of unstriped muscle fibres, on the posterior surface of this membrane. The so-called anterior layer of epithelium is not the site of the dilatator. The anterior pigment layer is purely epithelial. Bruch's membrane has a striate structure with rod-shaped nuclei quite different from the nuclei of the anterior epithelium. These nuclei, which are characteristic of unstriped muscle fibres, are sparse, and found mainly in the vicinity of the ciliary border of the sphincter.

Fleischer's (108, The development of the lachrymal canaliculi in mammals) investigations show that in mammals both canaliculi develop from the upper end of the canal rudiment and grow into the upper and lower lid. The occasional development of accessory puncta is explained by division of the canaliculi in their growth toward the surface of the epithelium.

Krueckmann (109, Embryology and development of supporting tissue in the optic nerve and retina) lays stress on the generic relation of pigment epithelium to glia-cells, and illustrates this view by specimens of a rat embryo and of a chick 8 days old. So-called primary glia is still to be found in the fully developed eye in the form of Mueller's supporting cells. The principal feature of the second stage of development of the neuroglia is the development of astrocytes. In the nerve as well as in the retina, the protoplasm of the glia cells is reticular in structure.

Loeb (111, Some cellular changes in the primary optic vesicle of Necturus) has studied the development of the optic vesicles in Necturus and finds the lumen of the neural canal and later of the optic vescicles filled at first with a mass that seems to be of cellular nature. The cells are probably

derived from the walls, and later on disappear. The paper is well illustrated. ALLING.

V.—PHYSIOLOGY.

112. GELZA REVECZ. **Dependence of color threshold on achromatic stimulation.** *Zeitsch. f. Sinnesphys.*, 41, 1, p. 45.

113. GUTTMANN, A. **A case of green-blindness (deuteranopia) with unusual complications.** *Ibid.*, p. 45.

114. HEINRICH, W., and CHRISTEK, L. **Periodic disappearance of small points.** *Ibid.*, p. 59.

115. COLLIN and NAGEL, W. A. **Acquired violet-blindness (tritanopia).** *Ibid.*, p. 74.

116. GELZA REVECS. **The diminution of stimulus of colored lights by white.** *Ibid.*, 2, p. 102.

117. LEVY, MAX. **A case of congenital bilateral blue-blindness (tritanopia).** *Graefe's Arch.*, lxii., 4, 364.

118. BIRCH-HIRSCHFELD, A. **Influence of light-adaptation on structure of nerve-cells of the retina in the dove.** *Ibid.*, lxiii., p. 85.

119. GARTEN, S. **Light-changes in the visual purple,** *Ibid.*, lxiii., p. 112.

120. SCHIRMER, O. **Note on my theory of lachrymal conduction.** *Ibid.*, p. 200.

121. V. PFLUGK. **Accommodation in the eye of the dove, ape, and man.** *Habilit. Schr. Thieraerzt. Hochschule*, Dresden, 1906.

122. TIGERSTEDT, R. **The limits of the visible spectrum.** *Biophys. Centralb.*, i., 1905.

123. COHEN, C. **Influence of age on adaptation.** *Klin. Monatsb.*, xliv., 1, p. 120.

124. BASLINI, C. A. **A new entoptic phenomenon.** *Arch. d'opht.*, xxii., p. 83.

125. PARSONS, H. J. **The innervation of the pupil.** *R. Lond. Ophth. Hosp. Rep.*, xvi., 1.

126. LEWIS, F. P. **The ciliary processes in accommodation.** *Am. Journ. of Oph.*, Nov., 1905.

127. EDRIDGE-GREEN. F. W. **Relation of processes in color-blindness to the psycho-physical theory.** *Ophthalmoscope*, Nov., 1905.

128. REICHERT, E. **A new schematic eye.** *Univ. Penn. Med. Bull.*, Dec., 1905.

129. DE HAAS, H. **Electric currents in the retina.** *Tydschr. voor Geneesk.*, 1906, 1, p. 8.

130. STEVENS, G. **New phenomenon of color conversion.** *Jour. Am. Med. Assn.*, July 21, 1906.

REVECZ (112, Dependence of color threshold on achromatic stimulation) studied the relation of the threshold value of a given stimulation by black and white to the intensity of the

stimulus, and found it to be a linear function of the given white stimulus. With increasing whiteness, the color had to be made more intense in order to be recognized. The highest chromatic value in this respect is attached to orange, then yellow, red, green, blue, and violet.

Guttmann [113, Case of green-blindness (deuteranopia) with unusual complications] reports the case of a mechanic, aged twenty-nine, with 5–6 D. of myopia, full vision, normal fundus, and congenital loss of sensation of red-green with weakened perception of blue and yellow. With the color top an equation could be made with yellow-gray and gray, and with blue-gray and gray, without any difference being detected between the decidedly yellow- and the blue-gray. There was marked diminution of perception of differences of illumination, which was most strikingly shown in the judgment of shades of the same color.

Heinrich and Christek (114, Periodic disappearance of small points) examined the periodic disappearance of small points which has been attributed to variations in attention. It was found that there was an evident dependence of this disappearance on slight changes in the accommodative curvature of the lens, which it was possible to observe with the ophthalmometer and which were synchronous with the phenomenon cited. It can also be demonstrated entoptically by fixing a light source through two small openings. Dispersion circles are then seen which approach or separate with every change in the distance of the images of the light source from each other on the retina due to accommodative changes in lens refraction.

Collin and Nagel [115, Acquired violet-blindness (tritanopia)] report the following cases: 1 A student suffering from peripheral rupture of the choroid, due to contusion of the globe, and serous imbibition of the macular region, showed in the injured eye a disturbance of color perception which was sharply limited to the fovea. Yellow was confounded with lilac; green of thallium and yellow-green, with blue. As the eye cleared, color perception was restored. 2. Neuro-retinitis albuminurica in a woman of twenty-four. Yellow appeared as blue, and equations were made of green with white and of

yellow with white. Color perception became normal as the eye got well. 3. Male, aged twenty-two, with bilateral partial optic nerve atrophy. Green-yellow was not recognized. Blue and green, and green and yellow were not distinguished. Violet of a shorter wave length than 430*mm* appeared colorless.

Revecz (116, The diminution of stimulus of colored lights by white) investigated the reciprocal relations between achromatic and chromatic stimulation of the eye. It was found that simultaneous perception of white weakens color stimuli, especially blue, then green, red, and yellow.

Levy [117, A case of congenital bilateral blue-blindness (tritanopia)] reports the case of a man of thirty, healthy, with normal vision and fundus, who had "had trouble" with color perception since childhood. Examination with Stilling's pseudo-isochromatic tables and Nagel's color-equation apparatus and tables failed to detect any marked abnormality. Holmgren's test wool showed violet blindness. Tests with the spectrum showed a decided shortening at the short-wave end. The neutral point lay in the yellow of the spectrum.

Birch-Hirschfeld (118, Influence of light-adaptation on structure of nerve-cells of the retina in the dove) found a diminution of chromatin in the ganglion cells of the retina of the dove after sudden light adaptation. Intense artificial light is much more active in destroying chromatin than diffuse daylight. An accumulation of basiophilic coloring matter was found in the inner member of the cones, in the form of an intensely colored horizontal stripe.

Garten (119, Light-changes in the visual purple) investigated the question of the visual yellow of Kuehne, and the possible variations in bleaching of visual purple by light of short and long wave-length, respectively. It was found that a retina exposed to unvarying violet light appears darker if previously bleached with yellow; that there was an increase of absorption of extreme violet rays and a diminution of that of red rays, after previous bleaching, and that the formation of visual yellow could be observed in the living eye of the

bleak-fish and frog, after exposure to sunlight. Fresh retinæ show a bright yellow only when the bleaching has been rapid.

SCHIRMER (120, Note on my theory of lachrymal conduction) has devised a model to demonstrate that the mucous membrane covering the nasal orifice of the naso-lachrymal duct acts as a valve, closing off the capillary opening to the nares in case of aspiration from the tear points, while no obstacle is presented to an outflow through the nasal passages.

v. PFLUGK (121, Accommodation in the eye of the dove, ape, and man) froze and sectioned the eyeballs of doves and apes to fix the conditions of lens curvature during accommodation and rest. Strophantin and eserin were used for the first type; curare and atropin, for the second. The major part of accommodation involves the posterior surface of the lens in the form of a lenticonus posterior. The position of rest is approximately spherical, but in accommodation there is an increasing inward bending of the posterior surface. In the dove there is a combination of corneal and lenticular accommodation. The ligamentum pectinatum is composed of elastic fibres. The dilatator pupillæ is probably represented by a flat layer of deeply pigmented cells on the posterior surface of the iris, corresponding to Bruch's membrane in mammals.

COHEN (123, Influence of age on adaptation) examined 30 healthy individuals with normal eyes to determine the conditions of adaptation in the various decades of life. In the first decennium, there is an unfavorable "adaptation power"—that is, threshold height of necessary stimulus, which improves in the third and fourth decade, and then gradually deteriorates. Rapidity of adaptation, which is low in childhood, becomes markedly diminished in old age. (These results are directly opposed to those of Woelflin, in *Graefe's Archiv.*)

PARSONS (125, The innervation of the pupil) discusses the innervation of the pupil. The existence of dilatator fibres is taken for proven by physiological experiments, and their innervation by the sympathetic granted. Contraction may depend on tonic action of the constrictor muscle or relaxation of the dilatator, or dilatation of the blood-vessels. Mydriasis is brought about by a reversal of either of these three factors.

Paradox pupillary contraction, which may take place after tonic impulses have been excluded by section of the constrictor paths at any point, may be explained, according to Anderson, by increased irritability of the nerveless sphincter, which probably depends on changes in vascularity and blood supply. There are no dilating fibres in the trunk of the oculomotor nerve. They are found in the cervical sympathetic only. The centre for the pupillary reflex is probably in the nucleus of the third nerve. Paradox pupillary dilatation may occur, as in cats, after removal of the superior cervical ganglion, and instillation of eserin or exposure to light. The induction of slight dyspnœa will then cause almost complete mydriasis on the operated side (this could be explained on the basis of Meltzer-Auer's observations of inhibitory fibres running to the dilatator from the ganglion. P. H. F.). Contraction consensual with accommodation is a constrictor phenomenon which is really synergetic with convergence. The sensorial reflex is a dilatator phase which may be excited by pain, contact, and other stimuli.

Lewis (126, The ciliary processes in accommodation) considers the ciliary processes to be made up of erectile tissue. Accommodation is virtually a vascular phenomenon. The size of the processes is regulated by the degree of contraction of the circular fibres of the ciliary muscle, and on this the convexity of the lens depends directly.

Edridge-Green (127, Relation of processes in color-blindness to the psycho-physical theory) details his well-known theory of color preception, and again shows that the phenomena can only be explained by the assumption that each fibre of the optic nerve conducts waves of stimulus corresponding to all wave-lengths.

Reichert (128, A new schematic eye) has constructed a modification of Kuehne's schematic eye, consisting of a projection apparatus with light source, a lens holder, and a sight space. The last is a vessel containing a weak solution of creolin to allow the rays to be followed by the observer. Demonstrations can be made before students, showing the effect of astigmatism, accommodation, refraction changes, and so on.

DE HAAS (129, Electric currents in the retina) has studied the electric currents which can be demonstrated with a galvanometer when one electrode is placed on the cornea and another on the sclera. In the dark there is a rest-current, and when the eye is exposed to light, an action-current. Both originate in the layer of rods and cones, and the photo-electric reaction proves that, as was believed, the cones are active in perception of colors and of bright light, and the rods for weak light. If Hering's theory were correct, assimilation and dissimilation should be followed by currents of opposite course, but this is not the case, as all spectral colors produce currents of similar polarity.

STEVENS (130, New phenomenon of color conversion) describes an interesting experiment in color sensation. If a narrow stripe of color be placed in a large field of the complementary color and viewed with a fixed gaze, the colored stripe will disappear, and the whole space becomes of one color. He suggests that the difference in wave-lengths requires a different refraction, and this may have some bearing on the phenomenon. Red stripes on a green field seem to be most favorable for the experiment. ALLING.

VI.—REFRACTION AND ACCOMMODATION.

131. POLATTI. **Cavernous (lacunar) optic atrophy and dehiscence of the sclera in high myopia.** *Klin. Monatsbl. f. Aug.*, xliv., 1, p. 14.

132. STILLING, J. **The myopia of public-school-mistresses.** *Ibid.*, p. 41.

133. FLEISCHER. **Tears of Descemet's membrane in myopia.** *Ibid.*, p. 64.

134. FUSS. **The question of elastic tissue in normal and myopic eyes.** *Virchow's Arch.*, 183, p. 485.

135. GELPKE. **Operation for high myopia.** *Med. Klinik*, 2, p. 39.

136. STILLING, J. **The fundaments of my theory of myopia.** *Zeitsch. f. Aug.*, xv., 1, 1.

137. PANSE, G. **Lasting results of operation of high myopia.** *Ibid.*, p. 115.

138. BOURDEAUX, B. **Cure of myopic convergent squint by a modified diploscope.** *Soc. d'opht. de Paris*, Dec. 5, 1905.

139. BLACK, N. M. **Advantages and disadvantages of glasses in railway service.** *Am. Journ. of Ophth.*, Feb., 1906.

140. WEEKS, J. E. **Report of a case of diabetic myopia.** *Am. Journ. of Ophth.*, May, 1906.

141. JACKSON, ED. **The mechanism of accommodation and astigmatic accommodation.** *Am. Journ. of Ophth.*, May, 1906.

POLATTI [131, Cavernous (lacunar) optic atrophy and dehiscence of the sclera in high myopia] examined sections of the eye of a woman of sixty-eight, affected with myopia of over 30 D., and with marked atrophic patches about the macula. In one eye, there were an incomplete perforation of the sclera, *2mm* from the disk, to the temporal side, containing degenerated retinal tissue; a second complete perforation in the intervaginal space of the optic nerve, with similar contents; and a third in the lamina cribrosa. It is a question whether these dehiscences were congenital or due to myopia. Both nerves were markedly atrophic, and back of the lamina cribrosa there was an increasing loss of supporting connective-tissue network, besides the atrophy of nervous elements, so that actual cavities appeared, whose walls were formed of connective-tissue fibres. There was some proliferation of neuroglia. This myopic atrophy was a product of degeneration of the retina which was entirely destroyed in the area of the conus, and of consecutive ascending degeneration of the nerve.

STILLING (132, The myopia of public-school-mistresses) found only about 17% of myopia, including monocular error, in female school-teachers in Strassburg. There was only one case of excessive myopia with fundus changes. Handiwork is not engaged in to excess. Seggel's observation of diminished light-sense in myopia was not confirmed.

FLEISCHER (133, Tears of Descemet's membrane in myopia) reports the case of a boy of ten with myopia, R 20 D., L 25 D., and a girl of twenty-one with R M. 15 D., M. Asm., 5 D; L M. 9 D. In both cases there were transparent, double-bordered striations on the posterior surface of the cornea which looked like threads of spun glass. The parenchyma was cloudy. These changes were doubtless the expression of tears of Descemet's membrane as we see them in hydrophthalmus, which show that there was a deformation, by traction of the anterior segment of the globe, corresponding to the myopic traction-changes at the posterior pole, which are so well known, and which were marked in both cases.

Fuss (134, The question of elastic tissue in normal and myopic eyes) was unable to confirm Lange's finding of a lack of elastic fibres in the myopic eye. There is marked individual variation in the number and thickness of the elastic fibres of the sclera, and an increase takes place only in the first 20–30 years. Senile eyes can no longer be distinguished from those of middle age by the amount of elastic fibres. Three highly myopic eyes showed the same amount of elastic fibres (Weigert resorcin-fuchsin stain) as normal globes.

Gelpke (135, Operation for high myopia) answers some objections which have been raised against the operation for high myopia. In 146 cases he had only 2 detachments. If the technique is perfect, and careless "late discission" is avoided, the operation is a relative prophylaxis against complications.

Stilling (136, The fundaments of my theory of myopia) lays stress on the factor of growth under muscle pressure in the development of myopia. During near work, all the muscles of the eye are actively or passively stretched. The obliques are the decisive factor simply because their action is variable, while that of the other muscles is qualitatively constant. If the loop of the obliqui is open, the eye will retain its spherical form in case the tonus of recti and obliqui is equal. If the loop be closed, lateral growth will predominate if the tendon of the superior oblique runs in a median position, while antero-posterior development will predominate if the tendon runs transversely, unless this be compensated for by an increased tonus of the recti.

Panse (137, Lasting results of operation of high myopia) studied cases operated on by Pflueger according to Fukala's method. Twenty-four eyes were kept under observation for from 6 to 11 years, 14 for at least 10 years; the average vision was 0.3 before and 0.72 many years after operation. Panse believes that there is an improvement of retinal function in many cases, and that the operation, especially in already developed choroiditis, has a marked prophylactic action. The earlier the operation is performed, the better the results. In only 3 eyes was there a lack of change in refraction. In the other 19, which were hypermetropic

after operation, this had decreased or changed to myopia, even in patients over 40. The operation checks but does not stop the expansion at the posterior pole. There was no single case of loss of an eye or of detachment. Of 3 eyes with central choroiditis, 2 got good vision, while 2 others not operated on lost central vision.

BLACK (139, Advantages and disadvantages of glasses in railway service) after practical experience in riding six thousand miles in the cabs of engines believes that an employee (engineer or fireman) who has been continuously at work for five years is a safe man although an examination shows that it is necessary to wear glasses to obtain the standard vision. He is upheld in this opinion by the practically unanimous agreement of the ophthalmologists of the United States to whom he sent a list of questions bearing on this subject. ALLING.

Changes in refraction due to diabetes are rare. WEEKS (140, Report of a case of diabetic myopia) describes the case of a man fifty-two years old whose refraction he found to be R, +0.125 D.; L, +0.25 D.⊂−0.5 D.,cy ax 10°, with vision $\frac{20}{20}$. This was the same after three years but then the vision began to be blurred for distance. Coincident with this increasing defect in vision there developed polyuria and in a little over one month after the former examination, the refraction was R, −0.62 D.⊂ −0.5 D.,cy 90°; L, −0.5 D.⊂ −0.75 D.cy 40°; both, $\frac{20}{30}$. Still a month later after rigid diet the refraction again became hypermetropic. The change in the refraction has been thought to be due to increase in the refractive index of the lens as a result of presence of sugar in the fluids of the eye. ALLING.

JACKSON (141, The mechanism of accommodation and astigmatic accommodation) agrees with the generally accepted opinion that the crystalline lens is composed of curved elastic fibres and that accommodation is brought about by thickening of the lens through the release of the tension on the zonula. He has studied with the skiascope the refraction of the centre and of the edges of the lens when the eye was focused for distance as well as for near. The increase in refraction in accommodation was greater at the centre than at the

periphery but such differences varied greatly in individuals. He does not believe it impossible that the ciliary muscle contracts irregularly and thereby produces changes in astigmatism but rather explains this phenomenon on the supposition that there may exist asymmetry in the elasticity or arrangement of the lens fibres. ALLING.

VII.—MUSCLES AND NERVES.

142. HOWE, LUCIEN. **Field of fixation and methods of measuring it.** *Annals of Ophth.*, April, 1906.

143. FROEHLICH, C. **On unilateral atropinization in concomitant convergent squint.** *Klin. Monatsbl. f. Aug.*, xliv., 1, p. 1.

144. LOESER. **Paralysis of eye-muscles after lumbar anæsthesia.** *Med. Klinik*, 1906, No. 10.

145. CASPAR, L. **Observations on unilateral reflex pupillary paralysis.** *Arch. f. Aug.*, liv., 1, p. 53.

146. WINGENROTH, E. **Abducens paralysis due to disturbances of menstruation.** *Ibid.*, p. 68.

147. MILLER. **Vertical squint.** *Muench. med. Wochensch.*, 1906, 3, p. 7.

148. DREYFUSS, G. **Traumatic pupillary paralysis.** *Ibid.*, p. 355.

149. KREUZFUCHS, S. **Traumatic pupillary paralysis** (answer to the above). *Ibid.*, p. 466.

150. ADAM, C. **Case of abducens paralysis following spinal anæsthesia.** *Ibid.*, p. 360.

151. KEMPNER. **Disturbances in the ocular branches of the trigeminal, particularly the corneal reflex. Diagnostic significance.** *Berl. Klin. Wochensch.* 1906, p. 378.

152. SAHLI. **Cortical localization of conjugate deviation of eyes and head.** *D. Arch. f. Klin. Med.*, 1886, p. 1.

153. BACH. **The motor nuclear regions after lesion of peripheral nerves.** *Centralb. f. Nervenh. u. Psych.*, xxix., p. 140.

154. HUGUENIN. **Dizziness in ocular paralysis.** *Correspondenzbl. f. Schweiz. Aerzte*, 1906, 1, 1.

155. BIELSCHOWSKY, A., and LUDWIG, A., **Significance of latent muscular imbalance and of vertical deviation.** *v. Graefe's Arch.*, lxii., 3, p. 400.

156. REMY. **Two facts in the explanation of strabismus.** *Rec. d'Opht.*, xxviii., 179.

157. ZENTMAYER, W. **Paralysis of upward movements of the eye.** *Oph'logy*, Oct., 1905.

158. BALLANTINE, A. **Two cases of lid closure reflex of the pupil.** *Ibid.*, Feb., 1906.

159. BLAGOWESTCHENSKY. **The visual field in concomitant squint.** *Westn. Ophth.*, 1905, No. 6.

160. BLOK. **Occupational nystagmus.** *Tydshr. voor Geneesk.*, I, No.8.

161. GARIPNY, E. **Isolated paralysis of the superior oblique due to orbital traumatism.** *Rec. d'Opht.*, xxvii., p. 705.

162. ABADIE and DUPUY-DUTEMPS. **Facial hemi-spasm cured by a deep injection.** *Arch. d'Opht.*, xxvi., p. 70.

163. HOWE, L. **Note on the measurement of torsion.** *Amer. Jour. of Ophthal.*, May, 1906.

164. VALK, F. **Dextrophoria.** *Amer. Jour. of Ophthal.*, April, 1906.

165. COLBURN, J. E. **Fixation of the external rectus muscle in nystagmus and paralysis.** *Amer. Jour. of Ophthal.*, March, 1906.

166. CLAIBORNE, J. H. **Conjugate deviation.** *Jour. Amer. Med. Asso.*, Aug. 18, 1906.

167. REBER, W. **A study of convergence and its defects, including an analysis of four hundred and forty-one cases of exophoria.** *Jour. Amer. Med. Asso.*, Sept. 1, 1906.

168. DUANE, A. **Unilateral rotary nystagmus.** *Oph. Record*, Oct., 1906; also *Trans. Amer. Oph. Soc.*, 1906.

HOWE (142, Field of fixation and methods of measuring it) notes the prevalent disregard of torsion which takes place in the act of convergence and suggests its clinical importance. He gives a brief description of an instrument which he has devised for the measurement of torsion and promises a more detailed discussion of the whole question later. ALLING.

FROEHLICH (143, On unilateral atropinization in concomitant convergent squint) treated nine cases of convergent squint by atropinizing the fixing eye according to Worth. In five there was no result; in four the deviation was corrected. Of these, three were also treated with convex lenses. In the fourth case, only fingers could be counted, and after correction of the deviation there was no improvement in vision. Of the unsuccessful cases one had faulty projection; in another, a squint of the right eye became alternant, and the vision of the atropinized eye improved from $\frac{20}{100}$ to $\frac{20}{40}$. The originally fixing eye then became affected with squint, and vision fell from $\frac{20}{30}$ to $\frac{20}{100}$. Finally a right-sided squint again appeared, the vision of the squinting eye fell to $\frac{20}{70}$, and the originally fixing eye had vision $\frac{20}{20}$.

LOESER (144, Paralysis of eye-muscles after lumbar anæsthesia) observed left trochlearis paralysis after spinal anæs-

thesia with novacain, and left abducens paralysis after stovain anæsthesia. The disturbances appeared a few days after the operation and disappeared in a week or two. As all other factors were absent, a toxic effect is surmised, and ascribed to the intradural injection of the drug. It was impossible to determine whether the nerves or the nuclei were injured.

CASPAR (145, Observations on unilateral reflex pupillary paralysis) reports seven cases of unilateral reflex pupillary paralysis. In one case there was tabes, and in two a suspicion of tabes or paresis. In two, injury of the head near the affected eye and paralysis of ocular muscles had preceded. In three cases the lamed pupil was larger, and in three others, smaller, than its fellow. Reaction to convergence was not impaired. Caspar follows the explanation of Heddaeus, attributing a double origin to the iris branch of the oculomotor nerve, one root for light reaction arising in the sphincter nucleus and another for accommodative consensual reaction.

WINGENROTH (146, Abducens paralysis due to disturbances of menstruation) reports the case of a woman of thirty-one, who had an unusually sparse menstrual flow after an exhausting mountain climb. Immediately after, right abducens paralysis supervened. Eyes and nerves were otherwise normal. After establishment of the normal flow, the paralysis disappeared completely and finally. The disturbance could be explained by a small cerebral hemorrhage from overexertion with accompanying menstrual disorder, to cerebral hyperæmia due to suppression of the menses with or without brain hemorrhage, or to the effect of toxins which were not eliminated on account of suppresion of the menses.

MILLER (147, Vertical squint) believes, with Schoen, that vertical strabismus may have a deleterious effect on the vagus, and that the nervous disorder can be relieved by prisms. Of 10 cases so treated, 2 were cured of their "vagus" symptoms involving the heart, stomach, etc., by prismatic correction of the vertical deviation.

DREYFUSS (148, Traumatic pupillary paralysis) reports a case of meiosis and pupillary rigidity coming on seven days after crushing injury of the cervical vertebræ. There was

also flaccid paralysis of the upper, and spastic paralysis of the lower extremities, dyspnœa and æsthesia, and other symptoms due to the spinal lesion. Dreyfuss believes that reflex pupillary rigidity may also be caused by degeneration of fibres which transmit psychical impulses.

KREUZFUCHS (149, Traumatic pupillary paralysis: answer to the above) calls attention to the darkening reflex of the pupil, by way of the trigeminus dilatation centre in the cervical cord and sympathetic, which he has demonstrated in rabbits. The case reported above by Dreyfuss is further proof that elimination of the dilatation centre induces meiosis.

ADAM (150, Case of abducens paralysis following spinal anæsthesia) reports a case of left abducens paralysis developing three weeks after spinal anæsthesia with stovaine for herniotomy.

KEMPNER (151, Disturbances in the ocular branches of the trigeminal, particularly the corneal reflex) found, in a series of 150 examinations, 55 patients with organic and 27 with functional disease who showed disturbances of the ocular distribution of the trigeminal nerve. Unilateral loss or diminution of the corneal reflex was found in 32 cases, and was generally functional (of psychical origin). Organic reflex disturbance, seen in 31 cases, was generally organic unilateral, and complicated with sensory disturbances which are generally progressive. The corneal reflex could be elicited in newborn children. Soelder's corneo-mandibular reflex, consisting in a displacement of the jaw to the opposite side when the cornea is irritated, was found 11 times in 600 patients. No diagnostic significance could be determined.

SAHLI (152, Cortical localization of conjugate deviation of eyes and head) observed a stationary deviation of the eyes and head to the left which lasted at least three or four days, could be temporarily suppressed by an effort of the will, and was uncomplicated by other paralytic or spastic symptoms. On autopsy (œsophageal carcinoma) an abscess was discovered in the left frontal lobe. The conjugate deviation was a symptom of this destructive lesion. The common cortical centre for conjugate motions of the eyes and rotation of the head to the opposite side is located at the foot of the middle

cerebral gyrus. The angular gyrus, temporo-sphenoidal lobe, and underlying white substance are merely an area which transmits sensory stimuli which have a centripetal action on the position of the head and eyes.

Bach (153, The motor nuclear regions after lesion of peripheral nerves) avulsed a large portion of the oculomotor nerve together with the globe and the external ocular muscles. After six months most of the cells of the nuclei corresponding to the muscles had degenerated. There was, however, no degeneration of cells in the nuclei of Edinger-Westphal. These nuclei have not been proven to be the centres for the sphincter as they have been found normal in a number of cases of sphincter paralysis, and conversely, Siemerling has noted degeneration of these nuclei in a case where there was no paralysis of the sphincter.

Huguenin (154, Dizziness in ocular paralysis) claims that paralysis of the abducens and internus cause no vertigo as long as the gaze remains in the horizontal plane. Tilting of the retinal pictures is the factor causing a feeling of insecurity, as in travelling in cars. It is this factor which causes dizziness in paralysis of the oblique muscles.

Bielschowsky and Ludwig (155, Significance of latent muscular imbalance and of vertical deviation) lay stress on the distinction between actual imbalance depending on mechanical factors, and latent heterophoria due to nervous influence. The latter, as in the form of fusion stimulus, cannot always be excluded. Their statistics show that neuropathic individuals are not more subject to heterophoria than healthy ones. The highest degrees, up to 15° of latent vertical divergence, were found in persons who did not have any untoward symptoms. In hyperphoria, the deviation is most marked in adduction of the squinting eye. Latent rotation of meridians (cyclophoria) is rarely found as an uncomplicated symptom, as other evidences of muscular imbalance are presented in cases of paralysis or insufficiency of the oblique muscles.

Zentmayer (157, Paralysis of upward movements of the eye) reports a case of ocular motor paralysis with sudden onset. Convergence was weakened and there was loss of

upward motion of both eyes separately or conjugate. The lesion was probably situated near the aqueduct of Sylvius, involving the oculomotor nuclei. ALLING.

BALLANTINE (158, Two cases of lid closure reflex of the pupil) examined a girl, aged seventeen, suffering with chorea and rheumatism. At the first examination there was still some photophobia with marked blepharospasm. It was noted that the pupils became smaller when the lids were opened. The same change took place while the lids were held open and the patient tried to close them. This pupillary contraction could be elicited only when the lid closure was of very short duration, and after energetic closure lasting for some time the pupils remained contracted until the exertion had passed over. This condition persisted after the patient had recovered, and was probably congenital, like the lid-closure movements. The second patient was a nervous woman with attacks of functional spasm. She was highly myopic. The occurrence of this reflex in hysteria has been described previously, notably by Westphal. MARSHALL.

BLAGOWESTCHENSKY (159, The visual field in concomitant squint) tested the monocular field of vision of 36 eyes with convergent squint of which 17 were amblyopic, and 21 divergent squints, of which 9 were amblyopic. He concludes that the limitation of the field in both forms is to be ascribed to the underlying amblyopia and not directly to the strabismus. In the few cases in which there was limitation without visual defect, the disturbance was so slight as to be explicable by errors of examination.

BLOK (160, Occupational nystagmus) observed horizontal nystagmus with rapid excursions in a man of twenty who was anæmic, weak, and nervous. There was no disease of the eye. The symptoms disappeared after a few days' rest and were probably to be explained as an occupational disturbance like miner's nystagmus.

ABADIE and DUPUY-DUTEMPS (162, Facial hemispasm cured by a deep injection) used alcohol injections into the stylo-mastoid foramen in the case of a seamstress aged fifty-six, with hemi-facial spasm and blepharospasm of 16 years' duration. The eye could not be opened on account of the

facial spasm. The other eye had been injured and had only V 1/20. A complete cure resulted. The injection can be made absolutely painless by the addition of cocain or stovain.

Howe (163, Note on the measurement of torsion) in this paper presents a chapter from his forthcoming book on the muscles of the eye. He discusses methods of measurement of the field of fixation by means of perimeter and tropometer, and points out the value of a knowledge as to (1) whether a deviation of one or both eyes exists, (2) which eye is affected, (3) exactly which muscle or group of muscles is at fault, and (4) whether deviation is due to spasm or paralysis. Alling.

Valk (164, Dextrophoria) using the tropometer of Stevens to measure the field of fixation finds occasionally a weak external rectus in one eye, associated with an insufficient internal rectus of the other, *i. e.*, a tendency for both eyes to rotate either right or left, and believes such errors capable of causing eye-strain. He calls this condition dextrophoria and lævophoria. Alling.

Colburn (165, Fixation of the external rectus muscle in nystagmus and paralysis) has formerly described an operation for nystagmus which consists in fixing the external rectus muscle to the periosteum of the temporal wall of the orbit. He passes a doubly armed suture through the muscle and then through the periosteum and out through the skin, tying it over a plate. He now also recommends the procedure in selected cases of paralysis, fixing the externus and advancing the internus. Alling.

Claiborne (166, Conjugate deviation) points out the fact that conjugate deviation is of uncertain value in localization in apoplexy, because it is of transitory character since the other side of the brain probably takes up the function of the stricken side, and because the position for the cortical centre for associate movements is not yet established. He relates a case which he believes to be one of irritative lesion in a pia meningitis following middle-ear suppuration. The deviation of the eyes to the left was explained by finding a lesion at the autopsy in the region of the right inferior parietal lobe, which supports the views of many authorities as to the location of the centre for conjugate movements. Another case was

evidently one of a destructive lesion which improved under potassium iodide. He offers the following scheme for diagnosis.

Irritative lesions	Cortical:	Eyes look away from lesion.
	Nuclear:	Eyes look toward lesion.
Destructive lesions	Cortical:	Eyes look toward lesion.
	Nuclear:	Eyes look away from lesion.

ALLING.

REBER (167, A study of convergence and its defects, including an analysis of four hundred and forty-one cases of exophoria) believes exophoria to be a reversion to a lower type, since only in man and the anthropoid apes do we find the optic axes parallel. In his study of convergence he has found the average amount to be between ten and eleven metre angles, confirming Landolt. He finds the cover test the most reliable at a distance, but uses Maddox rod with small electric light for the near point, in preference to the vertical diplopia test. The treatment of exophoria should comprise: (*a*) Right living, (*b*) careful refraction, (*c*) convergence training, (*d*) prisms base in for infinity, (*e*) prisms base in for reading only, (*f*) tenotomy or advancement. ALLING.

According to DUANE (168, Unilateral rotary nystagmus) only fifty or sixty cases of unilateral nystagmus have been reported. Of these five have been purely rotary. In the case described the usual accompanying defects were conspicuous by their absence, namely, anisometropia, ametropia, unilateral amblyopia, squint or other ocular deviations or evidence of nerve or ear disease. The patient was conscious of diplopia with rhythmical oscillations of one image, and could herself see the nystagmus with the other stationary eye. ALLING.

Sections VIII.–XII. Reviewed by DR. R. SCHWEIGGER, Berlin.

VIII.—LIDS.

169. MACNAB, A. **Marginal blepharitis. Causes, pathology, and treatment.** *R. Lond. Ophth. Hosp. Rep.*, xvi., 3.

170. VOGT, A. **Premature grayness of the lashes, etc.** *Klin. Monatsbl. f. Aug.*, xliv., Q. 1, p. 228.

171. STEPHENSON, S. **Unusual coincidence of interstitial keratitis and turning gray of the lashes.** *Opht'scope*, Feb., 1906.

172. APETZ, W. **Symmetrical gangrene of both lids after injury to the brow.** *Muench. med. Wochensch.*, 1906, 19, p. 980.

173. VALUDE and DUCLOS. **Malignant lentigo of the lids.** *Soc. d'Opht. de Paris*, 6 February, 1905.

174. BRYANT. **Pigmentation of the lids in exophthalmic goitre.** *Clinical Journ.*, 26, April 1905.

175. FREYTAG, G. **Paradoxical lid-movements.** *Deutschmann's Beitraege*, No. 65, p. 275.

176. MUNTENDAM. **Associated movement of the upper lid.** *Ned. Tydsch. voor Geneesk.*, 1906, vol. i., No. 8.

177. SNYDACKER, E. **Plastic lid-operation with flap from the neck.** *Arch. of Ophth.*, XXXV., 1.

178. THOMPSON, J. J. **Surgical treatment of ptosis.** *Ann. of Oph.*, Oct., 1905.

179. KUHNT, H. **Operative enlargement of the lid-fissure with use of cutaneous tissue.** *Zeitsch. f. Aug.*, XV., 13, p. 238.

180. MONTHUS, A. **Beneficial effect of tarsorrhaphy in injuries of the globe.** *Arch. d'Opht.*, XXVI., p. 13.

181. BACH, L. **Symmetrical lipomatosis of the upper lids (Blepharochalazis?).** *Arch. f. Aug.*, liv., 1, p. 73.

182. HIRSCHBERG, J. **Congenital lymphangioma of lids, orbit, and face.** *Centralbl. f. prakt. Aug.*, XXX., p. 2.

183. HOSCH. **Ophthalmological miscellany. 6.—Lipo-dermoid of the conjunctiva.** *Arch. f. Aug.*, liv,, 2, p. 159.

184. OHSE. **Bilateral coloboma of the upper lids with dermoid of the sclero-corneal margin.** *Arch. f. Aug.*, liv., 3, 227.

185. ROSENMEYER, L. **Cirsoid neuroma and hydrophthalmus.** *Centralbl. f. prakt. Aug.*, XXX., 3, p. 70.

186. WUERDEMANN, H. V. **Primary metastatic sarcoma of lower lid and orbit. No recurrence for years after removal and exenteration of orbit.** *Ophthalmology*, Oct., 1905.

187. JOHNSTON, H. **Primary sarcoma of the eyelids.** *Ibid.*

188. PRAWOSSUD, N. **Two cases of cancer treated with radium.** *Westn. Oph.*, 1905, No. 6.

189. TROUSSEAU, A. **Epitheliomas of the lids. Radium or operation?** *Ann. d'Ocul.*, CXXXV., p. 60.

190. ROLLET. **Treatment of palpebral epithelioma. Blepharoplasty with sliding flap.** *Rev. génér. d'Opht.*, XXV., p. 49.

191. FAURE-LACAUSSADE. **Epithelioma of the lids.** *Soc. d'Opht. de Paris*, 6 February, 1906.

192. BAKER, C. **Two cases of plastic lid formation.** *Oph. Rec.*, April, 1906.

193. RISLEY, S. D. **Cavernous angioma of the eyelid.** *Oph. Rec.*, March, 1906.

MACNAB (169, Marginal blepharitis; causes, pathology, and

treatment) intends to show that marginal blepharitis is due to the same micro-organism as angular conjunctivitis, viz., the bacillus of Morax-Axenfeld. The germ is constantly present and clinically it is possible to demonstrate transitional forms of these affections. Zinc sulphate is beneficial in both diseases.

MARSHALL.

VOGT (170, Premature grayness of the lashes, etc.) reports a case of severe bilateral iridocyclitis in a man of eighteen, in whom several lashes at the middle of the upper lid turned white. Some were white only at the tip. There were some white hairs in the brows and there was partial baldness. Two months before, there had been no evidence of these changes. They progressed for three weeks and then remained stationary. Circulatory and nervous changes due to the iridocyclitis were the causal factors. Similar occurrence has been noted in cyclitis, sympathetic inflammation, and hemicrania. Spontaneous sudden grayness has been noted in quite young persons. Gray lashes cause dazzling. Irritant salves may stimulate the production of pigment.

STEPHENSON (171, Unusual coincidence of interstitial keratitis and turning gray of the lashes) reports the case of an unmarried woman of thirty-nine. The left eye had been slightly injured in December, 1899. It became inflamed, and was examined six weeks later. There were typical signs of congenital syphilis and well marked kerato-iritis. In August, 1901, the inner half of the lashes of the right eye became white. The hair was quite black. In March, 1905, the inner half of the upper lid showed several gray lashes interspersed with some black ones. There were signs of a persistent interstitial keratitis. Cases of uveitis with turning gray of the lashes are reported. MARSHALL.

APETZ (172, Symmetrical gangrene of both lids after injury to the brow) examined a child of eighteen months, which had fallen in the street receiving a skin wound *3mm* long over the frontal tuberosity which was superficial and healed promptly with a smooth scar. Three days later the skin of the forehead and lids began to swell, became discolored, and sloughed off. Fever was present. In the neighborhood of the glabella

a sharply defined swelling developed. On incision flaky pus with necrotic tissue was evacuated, containing streptococci. A second small abscess above the right lachrymal sac was opened. The skin of the upper lids as far as the orbicularis muscle became necrotic and this gangrenous process wandered past the external canthus to the lower lids. Under moist antiseptic dressings the wounds became clean and cicatrized smoothly. The lid-margins and cilia were unaffected. The spreading of the gangrenous area from a single focus on the brow to both upper and lower lids is explained by the distribution of the superficial lymphatics.

FREYTAG's (175, Paradoxical lid-movements) patient, a girl of twenty-seven, showed complete right oculomotor paralysis with paresis of the external rectus. This came on six months after an apoplectic attack with paralysis of the left side of the head and trunk which had improved. On associated motion of the eyes to the right, the right upper lid was raised completely and energetically. Where these symptoms have been acquired there are generally other disturbances of motility present, and paralyses are frequent.

MUNTENDAM (176, Associated movement of the upper lid) saw a woman of forty-seven with congenital ptosis. The paralyzed levator palpebræ of the right eye was able to raise the lid perfectly whenever the patient moved the lower jaw to the left or clenched her teeth. We must assume that the levator is innervated not only by the oculomotor nerve, but by fibres which have their origin in the nuclei of the facial and trigeminal, as well. JITTA.

SNYDACKER (177, Plastic lid-operation with flap from the neck) reports the following procedure which gave an excellent result in the case of a young man who had had Thiersch grafts applied to the lids eight years previously on account of total ectropion and marked cicatricial deformity following burns. The cicatricial strands were excised and the lids sutured together. A flap *2cm* long was taken from the sterno-cleido region, its lower end split and used to form lids, the upper part serving merely as a bridge. This part is covered with gutta-percha tissue to keep it from contact with the skin of the cheek. Six days later the bridge was cut through and

the temporal end of the new lids sutured in position. The thin skin of the neck is particularly adapted for use about the eyelids.

THOMPSON (178, Surgical treatment of ptosis) advises the following modification of Wolff's operation for advancement of the levator. A skin incision is made which extends up to the upper margin of the tarsus and the latter is separated from the underlying tissue. The orbicularis and the tendon of the levator are exposed back to the point of disappearance within the orbit. The tendon is then resected and anchored to the tarsus by mattrass sutures. ALLING.

KUHNT (179, Operative enlargement of the lid-fissure with use of cutaneous tissue) exposes the conjunctiva for purposes of treatment in old trachoma with cicatricial contraction by cutting through the lid angle and severing the external tarso-orbital ligament, besides reducing tension by making a vertical incision through the conjunctiva near the corneal margin. A large Thiersch graft is then placed in the blepharotomy wound. In case it is necessary to prevent all shrinkage or to improve the position of the lids, a lancet-shaped piece of skin is circumcised at the external angle and the above operation completed. The loosened skin area is then buried by sutures.

MONTHUS (180, Beneficial effect of tarsorrhaphy in injuries of the globe) reports 7 cases of injury of the globe in which tarsorrhaphy had an excellent effect. It is advised in all penetrating wounds of the globe (cornea, sclera, limbus) to take the place of scleral or other sutures. It is specially indicated in children and allows the bandage to be removed early and shortens the time of treatment.

BACH'S (181, Symmetrical lipomatosis of the upper lids—blepharochalazis?) young patient had a swelling of the entire upper lid of both eyes which had gradually increased during ten years. There was marked redness and tense elastic fluctuation. The swelling increased at the menstrual period. On incision, large masses of fat extruded and were abscised. Redness and fine wrinkling of the skin due to relaxation are the signs of blepharochalazis which is unattended by fat formation. Bach thinks his case was one of lipomatosis or

symmetrical lipoma of the lid with consecutive thinning and relaxation of the skin of the lid.

Hirschberg (182, Congenital lymphangioma of lids, orbit, and face) describes 2 cases of lymphangioma of the lids, conjunctiva, and orbit as well as of the face which had been under treatment from childhood to early adult life. The condition was said to be congenital and grew slowly with some swelling of the parts and occasional spontaneous hemorrhages. In one case the optic nerve had suffered. Microscopic examination of exsected portions showed cavernous spaces lined with endothelium.

Hosch (183, Ophthalmological miscellany. 6. Lipo-dermoid of the conjunctiva) examined a tumor situated just below the enlarged lachrymal gland, in the upper outer part of the conjunctiva of the globe between the insertion of the superior and that of the external rectus muscle. The patient was a woman of forty-one. The tumor was soft, not sensitive, about 1*cm* in diameter, covered by conjunctiva and showed a long fine hair. This tumor had become noticeable and disturbing by its growth during the preceding two weeks. At the same time a small elevation, flat and about the size of a half lentil, was seen at the sclero-corneal margin. This had been present since birth and caused no inconvenience. The location and sudden growth of the equatorial lipo-dermoid while the other remained unchanged is striking.

Ohse (184, Bi-lateral coloboma of the upper lids with dermoid of the sclero-corneal margin) reports the case of a girl of eleven who was mentally well developed but showed several congenital anomalies of a physical nature. The upper lid presented a split formation 2*cm* square. This space was occupied on closure of the lids by a tumor of the lower sclero-corneal margin whose surface resembled cutis and was covered with downy hairs. The right upper lid showed similar conditions although less marked. The inner third of the brows was drawn out of place. A narrow patch of hairy skin ran down 2.5*cm* from the forehead across the brow toward the left lid fissure. The nose was twisted and defective, and there were congenital anomalies of the frenulum, skin of the cheeks, and angle of the mouth and ear. An

operation was performed on the lid and the tumor of the left eye with good result. The theory of Van Duyse that amniotic bands are responsible for such developmental defects is accepted by Ohse for all colobomas of the lid and dermoids of the conjunctiva.

The tumor in the case reported by ROSENMEYER (185, Cirsoid neuroma and hydrophthalmus), of a girl of five, had increased in size from birth on, at first involving the upper lid only and later growing toward the temple. The globe was being pushed out of place, and Kroenlein's operation was performed; and as much as possible of the tumor, a neurofibroma, extirpated. Within about half a year hydrophthalmus developed and the whole corresponding side of the face became swollen and doughy without any inflammatory changes in the skin. The hydrophthalmus was attributed to lesion of the ciliary nerves.

JOHNSTON (187, Primary sarcoma of the eyelids) found 23 cases of melanosarcoma of the lids on record. In his case, the tumor occupied the exact middle of the lid between skin and conjunctiva. The growth was shelled out and did not recur. Rapid recurrence is the rule, and these growths may start from pigmented nævi or from scar tissue. In Johnston's case the origin was obscure. ALLING.

PRAWOSSUD (188, Two cases of cancer treated with radium) reports a case of epithelioma of the upper lid cured completely after 13 applications of radium bromide (0.01) with the usual precautions. Each treatment lasted from $3\frac{1}{2}$ to 5 hours, so that there were $43\frac{1}{4}$ hours in all within 3 months. In the second case, adenocarcinoma of the tear-sac, treatment with radium failed absolutely.

ROLLET (190, Treatment of palpebral epithelioma. Blepharoplasty with sliding flap) recommends excision of epithelioma of the lid with the formation of a vertical sliding flap instead of the usual horizontal one for blepharoplasty.

RISLEY (193, Cavernous angioma of the eyelid) saw an angioma in a child eleven weeks old which began near the outer canthus and involved about three-quarters of the right lower lid. It had been rapidly increasing in size from a few days after birth. Fearing deformity from the necessarily extensive

operation of excision he used electrolysis but further than causing the tumor to become harder no results were obtained. He then introduced an Ericsson suture forming numerous loops throughout the tumor. When the threads were tied the mass was completely strangulated and sloughed off in about a week. The resulting cicatrix showed no tendency to produce ectropion. ALLING.

Rechtes Auge

Linkes Auge

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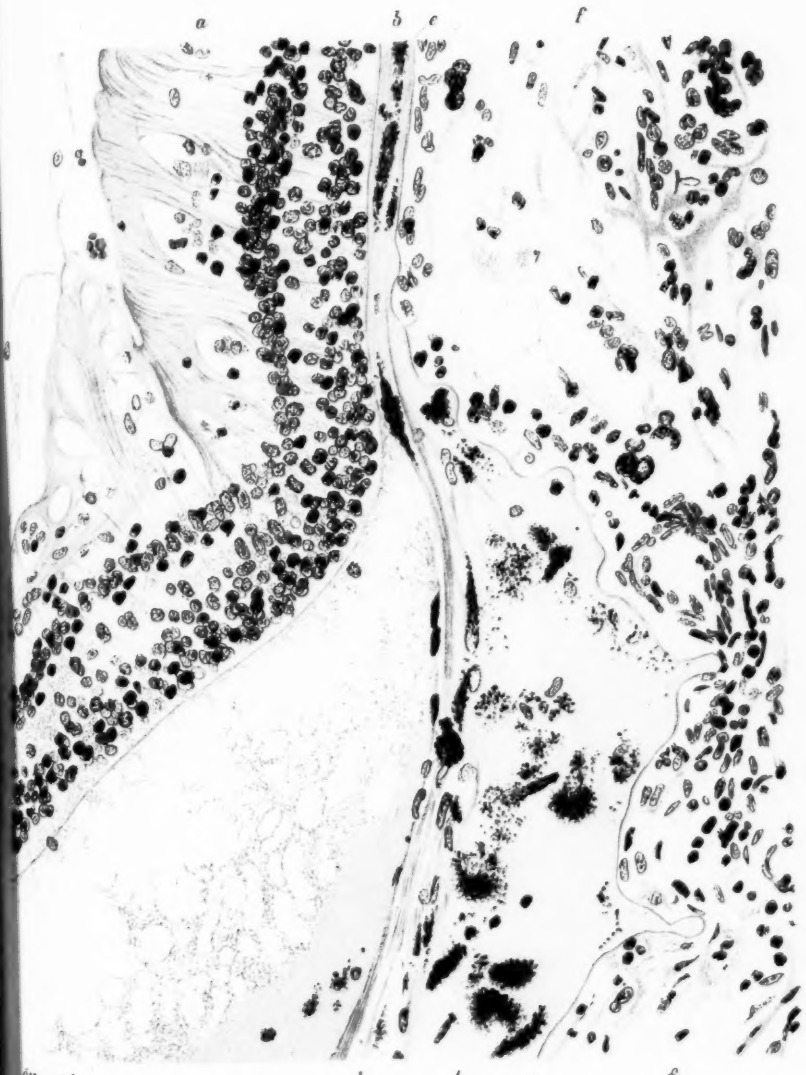
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